THE IRON TRADE REVIEW

Published Weekly
Vol. LXIII No. 26

CLEVELAND, DECEMBER 26, 1918

Entered as second-class matter at the post office at Cleveland, Ohio, under the act of March 3, 1879

Four Dollars a Year
Single Copies 15 Cents

GENERAL LIBRARY
DEC 27 1918
UNIV. OF MICH.

ROGERS, BROWN & CO.

Foundry
Malleable
Basic
Charcoal

PIG IRON

Low Phosphorus
Silvery
Bessemer

Foundry
Furnace

COKE

Heating
Domestic

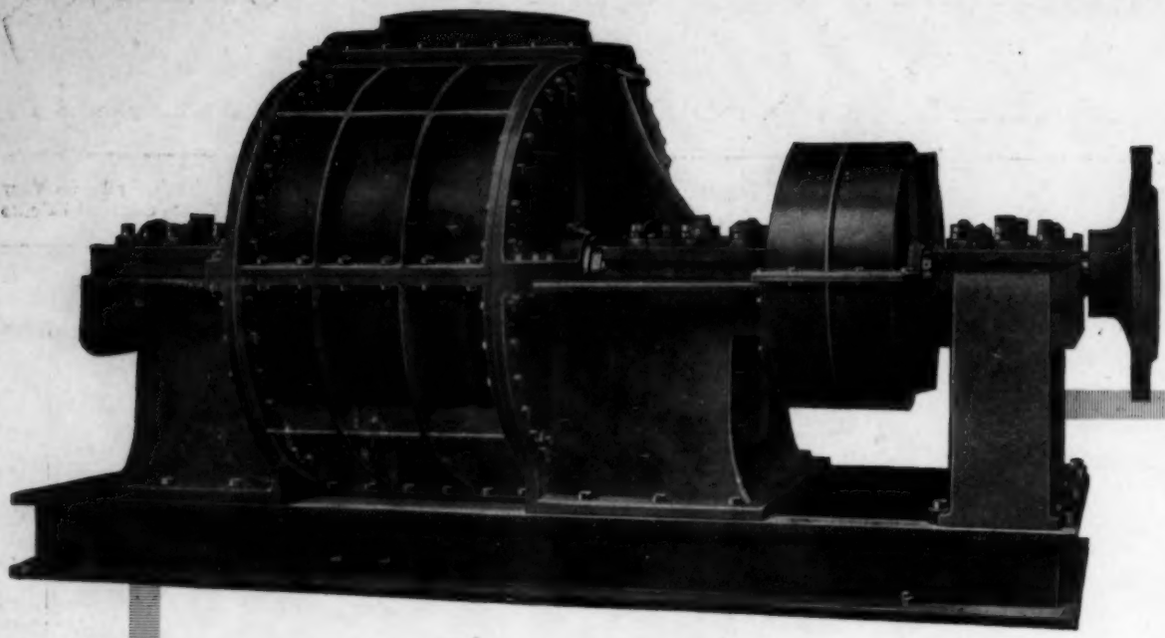
Bessemer Ferro Silicon
Ferro Manganese
Spiegeleisen
Fluor Spar
Ferro Chrome
Ferro Silicon

Manganese, Chrome and Iron Ores

Sales Offices

New York Cincinnati Chicago Buffalo Boston St. Louis
Pittsburgh Philadelphia Cleveland

Advertisers' Index, pages 174-175 Contents, page 1442 (Editorial) "Where-to-Buy", page 94
Engineering Directory, pages 140-141 Classified Advertisements, pages 152-173



Correct in Design—
Efficient in Operation—
Durable in Service

"CONNERSVILLE"

Gas Pumps Exhausters and Boosters

Connersville Gas Pumps are so constructed that they will run continuously for years on their self-oiling gears and journals, with very little depreciation in efficiency, and with practically no repairs.

The service to which Connersville Gas Pumps, Exhausters and Boosters can be put is almost unlimited.

They can be used for handling air, gas, steam, etc.

Built for any capacity from 25 to 40,000 cu. ft. per minute, and for any pressure between one-half and ten pounds.

Write for Catalog

THE CONNERSVILLE BLOWER CO.

CHICAGO
929 Monadnock Bldg.

CONNERSVILLE, IND.

NEW YORK
114 Liberty Street

THE IRON TRADE REVIEW

Vol. LXIII Cleveland, December 26, 1918 *No. 26*

Price Adjustments Are Main Topic

Some Leading Steelmakers Decide to Revise Old Orders to Harmonize with Reduced Prices Effective Jan. 1—New Form of Contract Now Being Used Binds Both Buyers and Sellers

AS the most abnormal year in many respects in the history of the industry draws to a close, the real test of the new market conditions in iron and steel is yet to be applied. With sellers indifferent and buyers expectant, the volume of bookings at the reduced prices remains relatively small. The transitory stage has not yet been passed and to this has been added the usual inventory taking and balancing of accounts of the year-end with their resulting brake on new commitments. Producers of iron and steel generally enter 1919 with order books that have remained liberal in size and fairly liquid in character despite the flood of cancellations, suspensions and adjustments recently received.

Contract adjustments for raw or semifinished material for further manufacturing remain the big question of the market. Some leading steel producers have put into effect a policy whereby they are agreeing to revise to the lower basis of prevailing prices, such old orders as shall be shipped after Jan. 1, when the new schedules become effective. In the leveling off of higher bookings, however, an exception is being made of such tonnage as has been ordered against a specific undertaking which is under contract with the buyer.

New Form of Contract

Timed apparently to accompany the concessions for the rewriting of old contracts, the proposed uniform contract covering mill products which will make impossible such revision on business taken hereafter, has been announced. Already various producers have put this instrument into effect on new sales and it is expected that its adoption will be general. The distinct and vital feature of the new contract is that it is equally binding upon both buyer and seller to fulfill their obligations. The consumer is obliged to specify fully by the first of each month the tonnage to be delivered the succeeding month, and the producer is pledged to make shipments in accordance with this plan. Where either buyer or seller fails to carry out his part of the agreement, he shall be liable to liquidated damages representing the difference between the contract and market prices on the unspecified or unshipped tonnage. The new contract is aimed at wiping out such long-standing practices as had rendered steel contracts little more than options.

Export Trade Prospects

Expectations in foreign trade are yet to be realized. There are, however, some developments of interest along that line. Among these are the final steps that have been taken in the organization of an export combination of various independent steelmakers. This action gives the country its second powerful producing interest capable of offering tonnage in the world's markets against a large and diversified mill capacity. Italy had doubled a recent inquiry and now seeks 300,000 tons of plates and 100,000 tons of shapes. The substitution of commercial steel for shell rounds under French contracts is proceeding more satisfactorily. Valley sheetmakers have booked some tonnages for the Netherlands. It is reported that Belgian rail contracts have been taken at Pittsburgh.

Weigh Iron Policies

In pig iron the main matter under discussion is the price policy to be pursued by the makers on tonnage booked for the first quarter at the prevailing fixed prices. There is considerable difference of opinion as to whether deliveries against these contracts should be adjusted to the reduced quotations effective Jan. 1 and the furnaces are expected to follow individual policies along this line. Generally producers of iron now are quoting the $3 reduction on new business for shipment after Jan. 1. Sales have been numerous but the total tonnage has not been large. A sale of 3000 tons of malleable was made in Michigan and valley steelmakers are understood to have closed for some basic.

DECEMBER 26, 1918

THE IRON TRADE REVIEW

A weekly publication devoted to the Iron, Steel, Foundry and Metal-working Industries

Published Every Thursday by
THE PENTON PUBLISHING CO., Cleveland

BRANCH OFFICES

CHICAGO - - - - - 1147 Peoples Gas Bldg.
CINCINNATI - - - - - - 128 Opera Place
NEW YORK - - - - 2203-2206 No. 220 Broadway
PHILADELPHIA - - - - - 1316 Land Title Bldg.
PITTSBURGH - - - - - - 2148-49 Oliver Bldg.
WASHINGTON, D. C. - - - - - 40 Metzerott Bldg.
BIRMINGHAM, ENG. - - - - Prince's Chambers

Subscription, United States and Mexico, $4 per year. Canada $6, and other Foreign Countries, $8 per year.

Entered at the Postoffice at Cleveland as Second Class Matter

Copyright 1918 by the Penton Publishing Co.

IN THIS ISSUE

PAGE

IRON AND STEEL MARKET REVIEW 1441
EDITORIALS 1442, 1443
IRON AND STEEL PRICES 1444, 1496
INDEX TO MARKET REPORTS 1444
IRON AND STEEL MARKETS 1445
REHEATING AS CURE FOR RAIL FISSURES 1457
Tests With New Cupric Chloride Etching Reagent Seem to Support Theory That Transverse Failures Are Due to Defect in the Steel—Reheating of Blooms Will Diffuse Bands of Phosphorus.
EXPORTERS PLAN INCREASED SERVICE 1462
EXPERTS DISCUSS BIG GUN EROSION 1463
Scientists Who Have Made a Deep Study of Erosion Suggest Means for Lengthening the Life of a Big Gun by Reducing Erosion to a Minimum—Rapid Progress Shown by Recent Naval Tests.
TESTS PROVE MERIT OF CAST-STEEL CHAIN 1464
SWEDISH ORE OUTPUT GROWS 1465
SELECTING PROPER SIZE MILL ROLLS 1466
NEW RECORD IN FURNACE FLUX PRODUCTION 1469
MACHINE TOOL'S FUTURE IS IN EXPORT 1470
American Equipment Industry Increased 100 Per Cent in Wartime—Must Find Outlet in Foreign Markets—Government Should Co-operate in Every Way Possible With Reference to Prices, Etc.
SHOW PROGRESS OF BIG GUN PROGRAM 1473
SEASON'S ORE MARK IS SATISFACTORY 1476
BRITAIN RETAINS FIRM GRIP ON PRICES 1477
INDUSTRIES BOARD ENDING CAREER 1479

Contract Reform is Demanded

IT has been stated facetiously by steelmakers themselves, that heretofore a contract has been a contract only when it was not a steel contract. For many years, dating back, in fact, to the decade of price cutting wars which preceded the formation of the United States Steel Corp., a steel contract has been looked upon as binding only on the seller. In fact, such contracts have been regarded as no more than options on the part of the buyers. This state of affairs, of course, was originated by the industry itself as a concession designed to attract considerable business which consumers otherwise would have been in no hurry to close.

In recent years numerous efforts have been gotten under way to discourage the employment of the old forms of contract. Steelmakers obligated themselves by binding contracts to take their supplies of pig iron, coke, ore and other raw materials without reference to the complexion of the market at the time of delivery. In turn, they felt that the disposal of their finished products on an equally sure basis should be arranged. The movement to secure a reform in the manner of contracting for finished steel products, however, never previously has been pressed to a conclusion by the steel producers of the country.

Therefore, now that the readjustment from a war to a peace basis has been gotten under way, consumers are endeavoring in the usual way to take advantage of the reduction in prices which has developed as of Jan. 1. The consumers are asserting themselves in a variety of ways but their purpose is alike. What they want is a readjustment in their contracts whereby the mills will bill them at the reduced prices for all shipments made after Jan. 1, irrespective of the time or the price at which these contracts originally were placed. Some of the leading mills have acceded to this demand of the buyers and will make this revision except where the material is for a specific purpose under order.

One thing that the whole steel industry is learning as a result of the present situation, is that contracts in the future must not be made on the same loose basis as in the past. Contracts for raw materials are inviolable. Hence, the contracts which the steelmakers enter into with their customers should be made inviolable.

A form of contract which should answer all requirements and which will be binding upon buyer and seller alike, has been drafted by the contract obligations committee of the American Iron and Steel institute. The new form of contract already is in effect and is given in full in this issue. Leaders in the steel industry will welcome its adoption, since they keenly realize that the old form of contract put them under great disadvantages without any compensating benefits. They realize that consumers in the long run never take more raw materials than they can use and that hence there is only a certain amount of business available and that this amount cannot be increased by the use of such concessions as relieving the buyer of his obligations under the contract. For the buyers, the stabilizing effect of a contract that has a full face value, likewise should be beneficial.

No Time to Lose Perspective

THIS of all times is one when both the producers and consumers of steel should keep their heads about them and when something more than mere surface conditions should be taken as a guide to policy. Producers should not allow themselves to become pessimistic because there has not been more prompt response on the part of buyers to the lower prices recently announced, which, while not effective until Jan. 1, nevertheless have been quoted on current business for delivery after that date. Aside from the fact that this is the quiet period of the year because the desire to make the annual inventories as favorable as possible restricts purchases, it is only natural that buyers should test the market to the limit to satisfy themselves that a further decline is not coming.

On the other hand, buyers should not be misled by

the apparent eagerness on the part of producers to secure business, as is manifested in the fact that there is hardly a kind of steel either semifinished or finished on which prompt delivery cannot now be made. This condition is due chiefly to the fact that producers want to reduce their inventories and are prepared to make sacrifices in the endeavor to be rid of high cost stocks. Once such supplies are disposed of, the manufacturer faces the problem of paying wartime wages and trying to make a profit at prices well below those which ruled during the war period.

It has been stated that the recently announced reductions are as great as can be made without affecting wages. Since also there is no desire on the part of the leaders of the steel industry to bring about labor troubles, it may be assumed that a strong stand will be made at price bases that become effective the first of the year. Buyers may think that by holding off they can force further concessions, but they should not overlook the fact that the manufacturers are well informed as to the size of their supplies.

It was the foreign demands that made the market for steel during the war and there is a strong possibility that export requirements once more will establish or at least will have a considerable bearing upon the prices that domestic consumers will be obliged to pay. It may be said that large though the war demands for steel were, they are likely to be insignificant compared with those of peace. The world for a time will want the American product for in spite of the peace preparations of England and France, it will require some time before these countries and certainly France, are financially able to go after the world's business on a large scale. The steel industry is going to make a strong play for foreign business and with the country never in a better position to finance export trade, domestic consumers who figure on much lower prices than now prevail will do well by themselves to keep a true perspective.

Broad Gaged Policies Needed

THERE is more than passing significance in the report from American export houses as set forth elsewhere in this issue of THE IRON TRADE REVIEW that a flood of cancellations has set in against foreign orders of steel and steel products placed in this country prior to April. The reason for the cancellations is said to be the buyers' dissatisfaction with the custom of charging them more for the supplies than the figure at which they are sold in the American market. The emergencies of war which made price a secondary consideration have passed, and buyers now are more critical of what they are asked to pay. The manufacturers would have no difficulty in disposing of their goods if the prices were brought down to the level of those prevailing in the United States. The question arises as to whether they will revise the prices or wait until the foreign buyers are forced to meet their conditions.

One expert on foreign trade points out that American manufacturers have heard a lot of oratory as to Europe's future requirements in the American markets, that they have attended many conventions and listened to many analyses of foreign needs and have been convinced that a wonderful market awaits them in the restoration of Europe, only to learn that Europe is now holding aloof and, in common with other countries, even China included, is demanding that Americans cut their prices. The conclusion he reaches is that the Americans cannot afford to permit the impression to prevail that they are profiteering.

Conditions in Europe are said to preclude the possibility of serious competition in the near future from that source for American manufacturers, and France, Belgium and other countries damaged by the war doubtless would be compelled to pay prices demanded of them for many months. But for a country situated like the United States, seeking to encourage foreign trade, it might not pay in the long run to insist on prices which prevailed during the war, unless conditions in the American market altered the circumstances. It is a critical time for the American manufacturers who want to build up their foreign trade. The market is there, conditions were never more favorable, but future orders will depend on the treatment those nations receive.

American manufacturers must not forget that while they now dominate the market the time is not far distant when competition will be restored. Competition may be expected speedily from England, a country which has considerably increased its capacity for production. The market in France will only remain open until France's iron and steel plants have been put in condition for operation, when France will be able to supply its own needs. The lesson to be drawn from the situation is do not antagonize foreign buyers, but encourage their confidence so that foreign trade will extend in good measure beyond the period of reconstruction.

Complaint frequently has been heard that foreign buyers have chafed over the terms for payment insisted on by American manufacturers. American consuls in foreign countries have pointed this out more than once. In many instances the manufacturers have insisted on receiving their money or an iron-clad guarantee before delivering their goods, even when the buyers were in a stronger financial position than the seller. The more consistent the credit terms can be made the more favorable the opportunities for foreign business will appear.

Iron and Steel Prices

Corrected to Wednesday Noon

SCRAP, WAREHOUSE AND IRON ORE PRICES ON PAGE 1496

PIG IRON

Bessemer, valley	$35.20
Bessemer, valley, del. Pittsburgh	36.60
Basic, valley	33.00
Basic, valley del., Pittsburgh	34.40
Basic, delivered eastern Pa.	36.90
Basic, Buffalo, furnace	33.00
Malleable, valley, del. Pittsburgh	35.90
Malleable, Chicago, furnace	34.50
Malleable, Buffalo, furnace	34.50

GOVERNMENT SCHEDULE

1.75 to 2.25 silicon (No. 2 foundry, No. 2 plain, and No. 3 southern), $34 furnace is base.

2.25 to 2.75 silicon (No. 2X, No. 1 Northern foundry, and No. 2 southern), base plus $1.25 or $35.25 furnace.

2.75 to 3.25 silicon (No. IX) base, plus $3.00 or $37 furnace. 3.25 to 3.75 silicon base, plus $5 or $39 furnace.

3.75 to 4.25 silicon, $40.00, plus $1 for each ⅛ per cent of silicon up to 5.75 per cent.

No. 1X, eastern delivered Phila.	40.90
No. 2, valley del., Pittsburgh	35.40
No. 2 foundry, Cleveland furnace	34.00
No. 2 foundry, Ironton furnace	34.00
No. 1 foundry, Chicago furnace	35.25
No. 2 foundry, Chicago furnace	34.00
No. 2X, eastern del., Phila.	39.15
No. 2X, eastern, N. J. tidewater	39.55
No. 2X foundry, Buffalo furnace	35.25
No. 2 plain, del. Philadelphia	37.90
No. 2 plain, N. J. tidewater	38.30
No. 2 southern, Birmingham	35.25
No. 2 southern, Cincinnati	38.85
No. 2 southern, Chicago	40.25
No. 2 southern, Phila.	41.75
No. 2 southern, Cleveland	40.25
No. 2 southern, Boston	43.25
No. 2 southern, St. Louis	39.50
Virginia, No. 2X, furnace	37.50 to 38.50
Virginia, No. 2X, Phila.	41.85
Virginia, No. 2X, Jersey City	42.15
Virginia, No. 2X, Boston	43.25
Gray Forge, valley, del. Pittsburgh	34.40
Silveries, 8%, furnace	47.50
Ohio Silveries, 8%, Chicago	51.30
Tennessee Silveries, 8%, Chicago	52.50
Low phos, standard, Phila.	57.00
Low phos, Lebanon, furnace	51.00 to 53.00
Low phos, standard, Pittsburgh	54.40
Charcoal, Superior, Chicago	38.70 to 39.00
Charcoal, Superior, Buffalo	38.50
Charcoal, southern to 2 per cent silicon, furnace	51.00

COKE

(At the ovens)

Connellsville furnace	$6.00
Connellsville foundry	7.00
Pocahontas furnace	8.00
Pocahontas foundry	8.00
New River foundry	8.00
New River furnace	8.00
Wise county furnace	7.25
Wise county foundry	8.25

FERROALLOYS

Ferromanganese, 70 per cent delivered	$230.00 to 250.00
Spiegel, 16 per cent fur., spot	65.00 to 70.00
Spiegel, contracts, furnace	70.00
Ferrocarbon, titanium, carloads, maker's plant	200.00
Ferrosilicon, 50 per cent, spot and contract, delivered	150.00 to 160.00
Bessemer ferrosilicon, 10 per cent	57.00
Bessemer ferrosilicon, 11 per cent	60.30
Bessemer ferrosilicon, 12 per cent	63.60

Ferrosilicon prices at Ashland, Ky., Jackson and New Straitsville, O.

SEMIFINISHED MATERIAL

BILLETS AND BLOOMS

Open-hearth, Pittsburgh	$47.50
Open-hearth, Philadelphia	51.50
Open-hearth, Youngstown	47.50
Bessemer, Pittsburgh	47.50
Bessemer, Youngstown	47.50
Forging, Pittsburgh	60.00
Forging, Philadelphia	64.00

SHEET BARS

Open-hearth, Pittsburgh	$51.00
Open-hearth, Youngstown	51.00
Bessemer, Pittsburgh	51.00
Bessemer, Youngstown	51.00

SLABS

Pittsburgh and Youngstown	$50.00

WIRE RODS AND SKELP

Wire rods, Pittsburgh	$57.00
Grooved skelp, Pittsburgh	2.90c
Sheared skelp, Pittsburgh	3.25c

SHAPES, PLATES AND BARS

(In cents per pound)

Structural shapes, Pitts.	3.00c
Structural shapes, Phila.	3.245c
Structural shapes, N. Y.	3.27c
Structural shapes, Chgo.	3.27c
Tank plates, Chicago	3.52c
Tank plates, Pittsburgh	3.25c
Tank plates, Philadelphia	3.495c
Tank plates, New York	3.52c
Bars, soft steel, Pittsburgh	2.90c
Bars, soft steel, Chicago	3.17c
Bars, soft steel, New York	3.17c
Bars, soft steel, Phila.	3.145c
Bar iron, common, Phila.	3.745c
Bar iron, common, Chicago	3.50c
Bar iron, refined, Chicago	5.00c
Bar iron, common, Cleveland	3.67c
Bar iron, common, New York	3.77c
Bar iron, common, Pittsburgh	3.50c
Bar iron, refined, Pittsburgh	5.00c
Hard steel bars, Chicago	3.00c

RAILS, TRACK MATERIAL

Angle bars, Pittsburgh base	3.25c
Angle bars, Chicago base	3.00c
Standard bessemer rails, mill	$55.00
Stand. open-hearth rails, mill	57.00
Light rails, 25 to 45, mill	3.25c
Relaying rails, light, St. L.	50.00 to 55.00
Spikes, railroad, Pitts.	3.90c
Track bolts, Pittsburgh	4.90c
Track bolts, Chicago	5.115c
Tie plates, Chicago	3.25c

WIRE PRODUCTS

(Per 100 lbs. to jobbers; retailers 5c more)

Wire nails, Pittsburgh	$3.50
Coated nails, Pittsburgh	3.45
Plain wire, Pittsburgh	3.25
Galvanized wire, Pittsburgh	3.95
Polished staples, Pittsburgh	3.65
Galvanized staples, Pittsburgh	4.35
Barb wire, painted, Pitts.	3.65
Barb wire, galvanized, Pitts.	4.35
Cut nails, Pittsburgh	5.00

CHAIN, PILING, STRIP STEEL

(In cents per pound)

Chain, 1 in. proof coil, Pitts.	7.50c
Sheet piling, base, Pitts.	4.00c to 5.00c

Cold rolled strip steel, hard coils, 1½ inches and wider by 0.100 inch and heavier, base per 100 pounds, 6.50c.

Market Report Index

	Page
Weekly Market Review	1441
Pig Iron	1445
Tin Plate	1446
Coke	1447
Merchant and Cast Iron Pipe	1447
Scrap	1448
Sheets	1449
Structural Shapes	1449
Bars	1450
Nuts, Bolts and Rivets	1450
Semifinished Steel	1450
Cars and Track Materials	1451
Ferroalloys	1451
Plates	1451
Wire	1451
Coke By-Products	1485
Machine Tools	1486

SHEETS

(In cents per pound)

SHEET MILL BLACK

No. 28, open-hearth, Pitts.	5.00c
No. 28, bessemer, Pitts.	5.00c
No. 28, open-hearth, Chi.	5.25c

TIN MILL BLACK

No. 28, open-hearth, Pitts.	5.00c
No. 28, bessemer, Pitts.	5.00c

GALVANIZED

No. 28, open-hearth, Pitts.	6.25c
No. 28, bessemer, Pitts.	6.25c
No. 28, open-hearth, Chi.	6.52c

BLUE ANNEALED

No. 10, open-hearth, Pitts.	4.25c
No. 10, bessemer, Pitts.	4.25c
No. 10, open-hearth, Chi.	4.52c
No. 10, open-hearth, Phila.	4.495c

TIN PLATE

(Per 100 lb. box)

Tin plate, coke base, Pitts.	$7.75

IRON AND STEEL PIPE

Base Pittsburgh

Base, Pittsburgh	Black Per cent off	Galv. Per cent off
¾ to 3 in., butt, steel	51	37½
¾ to 3 in., butt, iron	33	17

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	30
Iron, 3½ to 4½ inches, c. l.	12½

CAST IRON WATER PIPE

Without War Freight Tax

(Class B Pipe)

Class A pipe is $1 higher than Class B.

Four-inch, Chicago	69.80
Six-inch and over, Chicago	66.80
Four-inch, New York	70.70
Six-inch and over, N. Y.	67.70
Four-inch, Birmingham	63.00
Six-inch and over, Birmingham	60.00

HOOPS, BANDS, SHAFTING

Hoops, Pittsburgh	3.50c
Bands, Pittsburgh	3.50c
Hot rolled strip steel, Pitts.	3.50c
Hot rolled strip steel, Pitts. stamping quality	4.00c
Shafting, Pitts., carloads	17 off to list
Cotton ties, per bundle	nominal

RIVETS

Structural rivets, Pittsburgh	4.40c
Boiler rivets, Pittsburgh	4.50c
Rivets 7/16 in. and small., Pitts.	50 and 10 off

NUTS AND BOLTS

(Prices f. o. b. Pittsburgh)

CARRIAGE BOLTS

(⅝ x 6 inches, smaller and shorter)

Rolled thread	50-5 off
Cut thread	40-10-5 off
Larger and longer	40 off

MACHINE BOLTS

(⅝ x 4 inches, hot pressed nuts)

Rolled thread	50-10-5 off
Cut thread	50-5 off
Larger and longer	40-10 off
Cold pressed semifinished hexagon nuts ⅝ in. and larger	60-10-10 off
Cold pressed semifinished hexagon nuts ⅞ in. and smaller	70-5 off
Gimlet and cone point lag screws	50-10 off

NUTS

Hot pressed, square blank	2.50c off
Hot pressed, square tapped	2.30c off
Hot pressed, hexagon blank	2.30c off
Hot pressed, hexagon tapped	2.10c off
Cold pressed, square blank	2.25c off
Cold pressed, square tapped	2.00c off
Cold pressed, hexagon blank	2.25c off
Cold pressed, hexagon tapped	2.00c off

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago)

Quotation on leading products December 25, average for November, 1918, average for September, 1918, and average for December, 1917. Prices are those ruling in the largest percentage of sales at the dates named.

	Price	Average prices		
	Dec. 25, 1918	Nov. 1918	Sept. 1918	Dec. 1917
Bessemer, valley del., Pittsburgh	$36.60	36.60	36.60	37.25
Basic, valley del., Pittsburgh	34.40	34.40	33.40	33.95
*No. 2 Foundry, Pittsburgh	35.40	35.40	34.40	33.95
*No. 2 Foundry, Chicago, furnace	34.00	34.00	33.00	33.00
Lake Superior charcoal, Chicago	38.70	38.70	37.70	37.50
Malleable, valley	34.50	35.00	34.00	34.45
Malleable, Chicago	34.50	34.50	33.50	37.50
**Southern, No. 2, Birmingham	35.25	35.25	33.50	33.50
*Southern Ohio No. 2, Ironton	34.00	34.00	33.00	33.00
Basic, eastern del., eastern Pa.	36.90	36.90	32.00	33.00
**No. 2X Virginia, furnace	38.00	38.00	33.50	33.50
**No. 2X, eastern del., Philadelphia	39.15	39.15	34.50	34.00
Ferromanganese, 70%, delivered	240.00	250.00	250.00	247.50
Bessemer billets, Pittsburgh	47.50	47.50	47.50	47.50
Bessemer sheet bars, Pittsburgh	51.00	51.00	51.00	51.00
Open-hearth sheet bars, Pittsburgh	51.00	51.00	51.00	51.00
Open-hearth billets, Pittsburgh	47.50	47.50	47.50	47.50
Steel bars, Pittsburgh	2.90	2.90	2.90	2.90
Steel bars, Chicago	3.17	3.17	3.17	2.90
Iron bars, Philadelphia	3.745	3.74	3.73	3.68
Iron bars, Cleveland	$ 3.64	3.64	3.64	3.64
Iron bars, Chicago mill	3.50	3.50	3.50	3.50
Beams, Chicago	3.27	3.27	3.27	3.00
Beams, Pittsburgh	3.00	3.00	3.00	3.00
Beams, Philadelphia	3.245	3.24	3.23	3.18
Tank plates, Pittsburgh	3.25	3.25	3.25	3.25
Tank plates, Chicago	3.52	3.52	3.52	3.25
Tank plates, Philadelphia	3.495	3.49	3.48	3.43
Sheets, blk., No. 28, Pittsburgh	5.00	5.00	5.00	5.00
Sheets, blue anld., No. 10, Pittsburgh	4.25	4.25	4.25	4.25
Sheets, galv., No. 28, Pittsburgh	6.25	6.25	6.25	6.25
Wire nails, Pittsburgh	3.50	3.50	3.50	3.50
Connellsville furnace coke	6.00	6.00	6.00	6.00
Connellsville foundry coke	7.00	7.00	7.00	7.00
Heavy melting steel, Pittsburgh	26.00	28.75	29.00	30.00
Heavy melting steel, eastern Pa.	22.50	28.00	28.50	28.75
Heavy melting steel, Chicago	24.00	29.00	29.00	28.90
No. 1 wrought, eastern Pa.	33.00	34.00	34.00	35.00
No. 1 wrought, Chicago	27.50	33.25	33.50	35.00
Rerolling rails, Chicago	27.50	34.00	34.00	35.00

*1.75 to 2.25 silicon. **2.25 to 2.75 silicon.

(FOR ADDITIONAL PRICES SEE PAGE 1496)

Old Contracts Occupy Attention

Pig Iron Makers Still Weighing Matters of Policy with Regard to Old Bookings and Reduced Prices to Apply Jan. 1—New Schedule Now Generally Being Quoted—Sales of Limited Amount

New York, Dec. 21.—Indications are becoming more numerous, as reflected in statements by eastern pig iron makers, that there will be general adoption, after Dec. 31, of the reduction of $3 in prices. At a meeting of producers held in Philadelphia yesterday, representatives of the furnaces however, declared generally against extending the reduction to old contracts on books. At the same time, it is understood, it was indicated in the expressions made that there would be a tendency to eliminate the Pittsburgh and Birmingham basing points beginning with January.

It is thought in some quarters that it still is too early to make statements as to what will be the policy of the furnaces with reference to tonnages due on old contracts. If there are to be any departures from the policy of holding consumers to the prices on old contracts, these probably would not become apparent before the first of the year. It can be stated at this time that not all furnaces hold views that the old prices should be insisted upon, at least in all cases, in connection with old contracts.

Consumers are waiting until the end of the year before making any requests upon the furnaces, but the expressions heard indicate that developments along this line may be expected. A few leading consumers who have been questioned had no idea as to what to expect but they look for reasonable treatment on the part of the furnaces. One very large consumer thinks that the prices at which he contracted will be billed on a furnace instead of a Pittsburgh or Birmingham base, but he is not sure whether the furnaces will give him a part of the $3 reduction. Another very large consumer looks for the abandonment of the Pittsburgh and Birmingham basing points and a further concession representing at least part of the $3 reduction. In no cases, however, are any decided demands being voiced as yet by any of the consumers. In fact, it is quite apparent to these interests that the position of the furnaces is exceedingly strong from the standpoint of bookings, and hence any concession which they may obtain will originate simply in the desire of pig iron makers not to profit disproportionately at the expense of their customers.

On very few occasions has activity in the pig iron market been at as low an ebb as at present. One seller who takes an important part of the business done in this district sold only one carload during the past week. If consumers are indisposed toward buying, however, furnaces are just as indifferent toward selling at this time. The latter interests are almost a unit in desiring to wait for a while before formulating their policy with regard to first half. Their large bookings put them in a position where they can well afford to pursue a waiting policy. The only inquiries of any importance are those from abroad. Some of these run into many thousands of tons but there are no indications that the prospective buyers are in a hurry to close. Then too, it continues difficult to obtain vessel space for making shipments abroad. Actual sales of pig iron for export during the past week involved only a few hundred tons.

Sellers Are Conservative

Cleveland, Dec. 24.—A few sales of iron, chiefly foundry, continue to be made for first half delivery at the reduced schedule by certain makers whose order books have been depleted by cancellations or suspensions. But as the number of producers in this position is exceedingly small and further since, buyers are indifferent toward placing orders at this time, the volume of business represented is negligible. The producers generally possessed of liberal order books, are just as lukewarm toward taking orders as the consumers are in placing them. Some buyers of basic who have been sounding out things have had considerable difficulty in developing quotations of $30 furnace, the reduced

level on this grade. One steelmaker has been negotiating for 10,000 to 15,000 tons for first half but is in no hurry to close. New inquiry is extremely light. As stated last week, allocations now are a thing of the past and barring a few adjustments of old orders, business by this route is at an end. Producers as a rule continue to oppose any revision of former first quarter contracts to accord with the new level of prices and this question is coming up for discussion on all sides.

Will Accept New Schedule

Philadelphia, Dec. 23.—Expressions made at an important meeting of the Eastern Pig Iron association last week indicate clearly the intention of eastern makers to quote $3 less than the present prices on first half business. Some producers are prepared now to book orders at the reduced prices for next year, while others desire to wait for the expiration of present government schedule before offering at the reduced level. The new prices apply only to new business and not to old contracts. There will be no immediate dropping of Pittsburgh and Birmingham basing points, except where they have put certain furnaces under a handicap in competition. For instance, Virginia furnaces will be obliged to compete with eastern furnaces in selling north. It is expected some Virginia iron shortly will be available for first half at considerably less than the Birmingham figure plus the full freight to destination. It also is likely that instead of the present silicon differentials, this Virginia iron will be available at $1 over the base for each one-half of 1 per cent silicon. Future offers will be determined to a large extent by the present high costs, which for the east and Virginia average $32.50 to $34 per ton. In some cases the costs are lower and in some cases higher. Therefore the matter of price reduction is receiving more serious consideration than it would if there were a wider margin of profit. Two Buffalo makers are offering foundry for first half at $31, furnace, for No. 2 plain. Basic has been sold in the Mahoning and Shenango valleys at $31, furnace and sales have been made at Detroit at reduced prices. Only a few inquiries are out, including one for basic from the Nagle Steel Co. Makers of low phosphorus, in reply to inquiries, have informed customers that they will sell for shipment after Jan. 1 at a $3 reduction. Included in the week's sales was one lot of 1000 tons of standard low phosphorus for first half which went at present prices.

Buffalo Upholds New Schedule

Buffalo, Dec. 23.—Furnacemen in the Buffalo district are expected to adhere to the new reduced price schedule as recommended by the heads of the industry. The $3 reduction probably will prevail on all commodities designated. Contracts have already been made by one Buffalo concern at the reduced price, delivery to be made during the first half. Most furnaces are well sold up for at least three or four months, but have iron for sale for the last half. They still have capacity for about the end of the first half and at least one furnace has announced its willingness to take on second half business. Although no definite policy has been determined on for unfilled tonnage for delivery after the first of the year, most of the furnacemen probably will ask customers to accept iron at the booked prices until delivery is completed.

Market Still at Sea

Chicago, Dec. 23.—Unsettled conditions continue in the pig iron market, and as a result there is no inquiry or buying. The action of the war industries board in quitting its policy of fixing prices, coupled with the simultaneous announcement of a recommendation for a reduction of $3 per ton has given rise to problems which have been difficult of solution. It seems fairly well settled that contracts made hereafter for delivery during first half of 1919 will be at the reduced figure, but it is far from a settled matter that contracts already made for that delivery will be reduced to the same figure. Pig iron contracts in the past have always been regarded as firm and not subject to changes occurring after they were made. The argument made by melters in the present instance is that if the war industries board had continued price control, the figures suggested at its meeting a fortnight ago would have been those applying for first quarter of next year. On this argument melters are asking that producers consider the price as semi-official, and reduce their contracts accordingly. It is believed that the present week will see some basis reached to cover this situation. Most production for first half already has been contracted and nearly every melter is covered for the larger portion of his requirements and as a result the present slow market is not causing apprehension to the furnaces.

Inquiry Slow; New Prices Offered

Cincinnati, Dec. 21.—Inquiry for pig iron has slowed down to the point where there is none to report. Immediately after the lifting of price regulations a number of melters attempted to feel out the market for first and second quarter shipment, and a few inquiries were also received for delivery in the last half of next year. Some southern iron can be had for last half shipment at $31, Birmingham, but no sales have been made on this basis. Most southern makers are inclined to wait until after the end of the year before making known their intentions as to the new schedule. It is also true that no business has been accepted by them on this basis. Unless some cancellations are made that would cut in on order books somewhat heavily producers in the two districts named will have no cause to worry about the first half because they are fairly well sold up for that period. Hold-up orders from the foundries are not quite as numerous.

Wait for New Prices

St. Louis, Dec. 21.—The pig iron market here is at a virtual standstill. One Southern producer reported the sale of about 800 tons of foundry on allocation on an old order. Users are busy with inventories, and with prospects for a reduction in price, no one is anxious to close business on the old basis. Producers are not pushing matters and are about the most hopeful factors in the trade. This is true especially of southern furnaces, who see a big outlet for their surplus in export business, which it is claimed is developing satisfactorily. Italy, Japan and France have engaged substantial tonnages, and according to representatives of the makers this business is on surprisingly liberal terms. There is little likelihood of a necessity for interruption in production for some time to come. The domestic demand is not showing particularly encouraging symptoms. Plants with war business continue to curtail activities and let out men. While in all cases the announcement is made that preparations are being made to return to a peace basis there is so much of this preparation well-posted members of the industry fear there will not be sufficient business for the aggregate capacity. Mills are receiving numerous requests for cancellations and deferred shipments. All the important plants are covered on iron well into next year, except some in the non-war class, and these will not make any effort to purchase until after the first of the year. On the whole, the trade here has taken the announcement of reduced prices and the placing of the industry back on its own resources Jan. 1 with considerable satisfaction. After the long months of artificial prices and distribution the return to an open market will be welcomed. A few of the most hopeful members of the selling side express the belief that prices may possibly work higher. This view, however, is not generally shared.

Makers Slow to Sell

Birmingham, Ala., Dec. 23.—Few southern manufacturers of pig iron as yet will sell their product at the recommended reduced price for delivery during the first half of 1919. But a few furnaces will accept orders on this basis. Some small sales were made the past week. The probable make for the first half of 1919 practically has been sold. There have been, however, some cancellations, the most important of which is a portion of the 80,000 tons of basic for the British government for November-December delivery upon which several Alabama furnaces were working. The lull in buying is not more pronounced than it was a few years ago at this time of the year. Recent inquiries would indicate that there will be need for a large amount of iron. The production of iron in Alabama is still under desired output. With an official output of 1,286,571 tons for the first half of the year, it is estimated 1918 will show a furnace output of 2,500,530 tons. The production of iron in Alabama in 1917 was 2,953,705 tons and in 1916 2,762,885.

Limited Demand

Appearing in Tin Plate and 50 Per Cent Operations Continue

Pittsburgh, Dec. 24.—Only limited demands are being made upon the makers of tin plate at present and 50 per cent operation of the mills easily is taking care of passing business. Current production is largely for the salmon packers on orders placed some time ago. Manufacturers

of perishable food containers carried over some surplus from last season, for the reason that while the crops were big, the scarcity of labor materially curtailed the pack. Makers of these containers naturally are moving slowly in the matter of their 1919 requirements, while those producing cans for other purposes got fairly well along on the program of substituting card and fiberboard for tin plate, before the armistice was signed and the restrictions on the use of tin plate were removed. It is believed that these substitute packages will have to be used up before the former demand from dry food container manufacturers is restored and perishable food container requirements will be lessened to the extent of the 1918 carryover. Tin plate producers, however, are not pessimistic, taking the ground that there will be a quick return to tin cans when the results of other kinds of packages are fully known and they also look for big demands as a result of the fact that this country will have to feed most of Europe during the next year at least. Large quantities of condensed milk will go abroad and the ordinary package is a tin can. Possibility of large export demands also is encouraging to producers.

Some Buying

Appears in Cast Iron Pipe—Direct Users Take Wrought

Chicago, Dec. 24.—Although cities for the most part are remaining out of the market for cast iron pipe some small inquiries are appearing and as soon as the annual budget of various municipalities have been made it is expected additional buying will come to the front. Prices have not been changed from war levels and until the pig iron situation is cleared there will be no change. Wyandotte, Mich., will open bids Dec. 30 on 270 tons for a water intake and Toledo will take figures Dec. 24 on 1000 tons of 6 and 12-inch.

Jobbers Not Buying Much

Pittsburgh, Dec. 24.—Jobbers are not doing much in pipe, either of steel or wrought iron but there is a rather good demand for consumers who buy direct and quite a good movement on old orders from these interests also is observed. Only one company has as yet issued price cards. The National Tube Co. card is expected to be out soon and others will appear soon afterward. Business is expected to go forward with more snap, once these cards have been issued.

Trading in East Quiet

New York, Dec. 23.—Trading in cast iron pipe remains quiet in the East, and little business is expected to develop until after the first of the year. The question of price revisions to go into effect about Jan. 1 is still unsettled, pending action by the makers of pig iron. It appears likely now that the latter will reduce their prices about $3 a ton, in which event a similar revision will probably be made by the pipe makers.

Await Coke Announcement

Fuel Administrator Garfield About to Make Declaration Regarding the Future of Fixed Prices After Jan. 1

Washington, Dec. 23.—(By wire.)—The indications today are that Fuel Administrator Garfield probably will announce tomorrow the future course on coke prices. The trade repeatedly has reported that the fuel administration contemplates taking off the fixed prices effective at the end of the year but officials here decline to discuss the subject, advising they are waiting for Administrator Garfield's action. The fuel administrator has announced that present coal prices and the zone system will continue at least until Feb. 1. Some time ago he said action might remove these regulations Dec. 15 but since he has made other statements. The war trade board today declared that except in the case of coal, coke, motion picture films or newsprint paper, all parties making agreement to use certain commodities for specific purposes if export license was issued, have been released from such agreement. Attention is called to the fact that this release relieves no one from the requirements of the trading-with-enemy act.

Active Sales in New England

New York, Dec. 21.—Large quantities of foundry coke, believed in fact to involve considerably more than 100,000 tons, were booked during the past week by the New England by-product producer. As stated in last week's issue of The Iron Trade Review, this interest has offered to replace first half contracts of regular customers with contracts for all of 1919. The first half contracts originally were placed at the $14 ovens price which the producers offered to replace with a provision for payment over the entire year on the Connellsville basis. With the price of foundry coke $7, at Connellsville ovens, the delivered price would be $11.40 in New England. The offer by the New England maker, therefore, was considered entirely satisfactory from the standpoint of the consumers.

Would Discontinue Price Fixing

Cincinnati, Dec. 21.—Oven operators are concerned over the probable action of the government in discontinuing price fixing. Since price fixing on iron and steel they feel has been abolished, the ban should be lifted as far as they are concerned. On the basis of the present output, which is still restricted, in the Connellsville field especially, the general prediction is that fuel would not cost more if competition was resumed, unrestricted by fixed prices. The consumption of foundry coke is not near as heavy as it was a month ago, but the output has been cut down in all districts. The improvement in the output within the past few days will not be able to fill the gap caused by the influenza epidemic.

St. Louis Market Quiet

St. Louis, Dec. 21.—The coke market here is quiet. Consumers with urgent needs are able to fill them, the tonnages available being from contracts of those who are not pressed at the moment. Considerable coke has been released by war contract cancellations and the slowing down in melting operations. The leading producer in this district has been running at capacity, developing small surpluses. The movement from the East continues moderately strong. No contracting for next year is being done. Inquiry from the West and Southwest continues heavy.

Production in South Improving

Birmingham, Ala., Dec. 23.—Coal and coke production in Alabama shows some improvement. Demands for both are strong, with no change in prices. The output of coal mines in Alabama in 1917 amounted to 20,413,811 tons and in 1916 to 18,234,625. While official figures are only in for 23 of the 52 weeks of 1919, the estimate is that the production this year will be about 19,000,000 tons. The coke production in 1917 in Alabama was 4,868,598 tons and it is believed the output this year will be about 4,500,000.

Manufacturers See Great Prosperity Ahead

New York, Dec. 21.—Conclusions that the question of the readjustment of industries of the country does not present to the business interests the insurmountable tasks that many injudicious newspaper statements cause the public to think exist, have caused the committee on readjustments of the National Association of Manufacturers held here at the hotel Astor a few days ago to issue the following statements:

It is our opinion there exists a well-defined attempt to create in the minds of the public and of business men of the United States the impression we are to experience in the near future an unheard of cessation of industry. Such an impression, we believe, is not in accordance with the facts.

It is our opinion the factories and stores of the United States are at present almost depleted of their normal stocks and that our country is on the threshhold of a most unprecedented business expansion owing to this domestic condition.

We are of the opinion that the developments of export trade will naturally follow the prestige gained by the United States of America in the markets of the world and that it is the duty of all manufacturers to foster and encourage such expansion of export business as may be normally and healthfully developed.

We caution all manufacturers against hasty action or conclusions in reference to employment questions, believing as we do that the normal demands of industry will supply work for all those now employed as well as the thousands of returning soldiers and sailors who will be returned into industry.

Scrap Decline Unchecked

Though Consumers Are Beginning to Show Some Interest in More Attractive Levels—Steel Low in East

FOR COMPLETE SCRAP PRICES SEE PAGE 1496

Chicago, Dec. 24.—Constant decline marks the scrap market in the west and present levels are far below the maximum prices prevailing a few weeks ago. Most consumers are still out of the market and much cancellation is being attempted. Dealers are clearing their yards of all available material that can be applied on contracts, endeavoring to ship as much tonnage on orders as possible before Dec. 31. Most activity now evident is trading between dealers, though some consumers apparently believe prices are at a level that dictates the wisdom of buying some tonnage against their future needs. Such buying of this kind as has come to light is a distinct reflection of the strength that underlies business. The Chicago, Milwaukee & St. Paul offers 2000 tons, including 250 tons of iron rails. The Rock Island offers 4000 tons, included in which is 800 tons of No. 1 steel rails, 400 tons of No. 1 wrought and 500 tons of No. 2 wrought.

Canada Offers Shell Scrap

New York, Dec. 23.—The holiday season has cast a still deeper pall over the scrap market. Trading at this time appears to be at a minimum, resulting in further declines in practically all grades. Among the principal items affected is cast scrap, which is off about $2, now holding nominally at $25 to $26; borings and turnings, which are around $13; and heavy melting steel, which dealers are buying in some instances at as low as $17. A factor for weakness in the present market for heavy melting steel is the possibility of heavy tonnages of shell steel being offered for resale as scrap. A lot of 20,000 tons has just been offered in this market by a Canadian munition maker, and similar large tonnages are expected to come out in this country as soon as cancellations become more fully adjusted. Although billets and some other such material may possibly be brought into competition with products of the mills, it is believed that much of the shell steel will undoubtedly be sold as scrap. It appears the government probably will act as selling agent in many instances, the difference between the original cost of the material and the selling price being refunded to the shell maker. The government is offering 1210 airplanes and 2000 airplane motors for bids Feb. 1.

Suspend Trading at Buffalo

Buffalo, Dec. 23.—The scrap market in this district is demoralized and there is no buying. Everything is suspended until 1919 because of the holiday season, the taking of inventory and the uncertainty of general conditions. Buyers would rather take a chance on the market after the first of the year than buy now at a stated price. Rejections amount to 50 per cent, and dealers are complaining that material is being rejected for insufficient reason. Serious developments may occur in the scrap trade here. Yardmen handling metals and dealing extensively in brass and copper will lose, it is said, all the profits they have made in the past two years, on account of the great drop in the prices of these metals. Heavy melting steel is down again and heavy melting cupola material off the schedule because there is no demand for it. An absence of demand for low phosphorus scrap is apparent. It is impossible at present to sell any of this scrap.

Steel Lower in East

Philadelphia, Dec. 23.—Heavy melting steel now is quoted from $22 to $23, delivered eastern Pennsylvania. Sales have been made to eastern steel companies at this range for quick shipment during the past week. There has been no future buying in this or any other grade, however. Expectations are that the price on heavy melting steel will go still lower. Prices on other grades of scrap are down $1 or more.

Some Consumers Interested

Cleveland, Dec. 23.—Several mills are nibbling in the scrap iron and steel market here, evidencing a willingness to buy for early delivery if the price is right, but not giving much of an idea as to price. Borings and turnings and heavy melting steel are the three grades mentioned in this connection. This has given dealers hope that some buying will be done in January. There was no surplus of scrap when war work in general ceased, and most mills have got down to bed rock in the matter of supplies, dealers point out. Prices are steadily going down, and there is little doubt but that these low quotations could be shaded. Most yard men will be caught with 1000 tons or more of stocks despite their efforts to clean up. Trading at present continues confined almost wholly to dealers. Some mills have offered to buy fair-sized lots of steel at $25.

Suspend Trading Until After Holidays

Cincinnati, Dec. 21.—Dealers seem to have decided to suspend business until after the holidays. Now and then a small tonnage of scrap for prompt shipment is taken by a melter whose shipments on contracts are not moving quite as fast as might be wanted. There are no offerings from the railroads in this vicinity. Purchases made from the small dealers on the outside are limited. No change in quotations are made, but the market is reported as being very weak.

Market Continues Demoralized

St. Louis, Dec. 23.—The scrap iron and steel market here continues in a demoralized condition. It is impossible to sell at most radical reductions. Requests for cancellations are growing daily and after Jan. 1, when many contracts expire, an added volume of cancellations is looked for. Further sharp cuts have been made in their lists by leading dealers. The demoralization has spread to yard men who will not purchase to recome to a halt. One operator said come to a halt. One operator is said he believes the day of $10 scrap is at hand. Railroads centering here have large tonnages to dispose of but realize it is hopeless to find purchasers. Aside from 14 cars, placed at private sale by the Missouri, Kansas & Texas, there were no offerings by the carriers this week. Rolling mill and foundry interests claim to have all the scrap they can use for a long time. Cooler heads in the industry, while admitting the situation is far from reassuring, believe it will not extend beyond scrap iron and steel. According to a well-posted dealer in scrap, the bottom should be touched shortly after the first of the year.

No Sign of Readjustment

Birmingham, Ala., Dec. 23.—The scrap iron and steel market in the South is stagnant and there is no promise of early readjustment. Stocks in hand are dwindling. Material is being purchased only as it is needed. Prices again are off at least $1 in a number of grades.

Society May Change Name

The American Institute of Mining Engineers is considering the changing of its name to the American Institute and Metallurgical Engineers. This change has been recommended in view of the large number of members in the institute affiliated with the iron and steel business and owing to the recent affiliation of the American Institute of Metals with this society. The members of the society will be asked to give an expression on the proposed change in a general letter about to be sent out.

Industries Board

To Wind Up Affairs Dec. 31—Chairman Baruch Going to France

Washington, Dec. 23.—Bernard M. Baruch, chairman of the war industries board, today formally announced the board would wind up its affairs Dec. 31, and that various functions will be transferred to permanent government departments, the transfers to be similar to those outlined in THE IRON TRADE REVIEW recently. Mr. Baruch will sail Dec. 31 to attend the peace conference as adviser to President Wilson. Vance C. McCormick also will go to Versailles, and probably H. A. Garfield, federal fuel administrator will attend. E. N. Hurley and Herbert C. Hoover are now in France. J. Leonard Replogle and other division chiefs will not go with Mr. Baruch, the chairman taking only his assistant, Harold Clark, of the law firm of Squire, Sanders & Dempsey, Cleveland.

The war trade board today announced the following as included in the list of removals from the export conservation list: Steel alloys, ingots, blooms, billets, plates, rails,

shapes, slabs, sheet bars, pig iron, ferrosilicon, spiegeleisen, nickel, scrap iron and steel, tin and tin plate. The board said if applicants for license to export tin or tinplate who had been refused will reapply their applications will be given immediate consideration. In applying for license to export tinplate applicants no longer will be required to fill out supplemental information sheet, X-4. Samples of commodities for import which have been restricted now will be considered for license if an affidavit is made stating the importation is for sample or demonstration purpose only.

To Rebuild Furnace

Blast furnace No. 3, of the Carnegie Steel Co. Sharon plant, has been blown out and will be rebuilt and enlarged from a daily capacity of 350 tons to 500 tons. To keep the tin plate and sheet mills in materials, the north side works of the company has been changed over from blooms and billets to sheet and tin bars.

Shape Prospects Improving

Excellent Outlook for Future Business Appears at Chicago—Italy Increases Inquiry to 100,000 Tons—Lettings Few

Chicago, Dec. 24.—Though no structural contracts have been closed in the West in the past week prospects for enlarged business are excellent. Public improvements in the city of Chicago already outlined are sufficient to require about 20,000 tons, largely structural steel. It is planned to proceed with this work as rapidly as possible and this tonnage will come onto the market early in the year. The steel for the Michigan boulevard bridge and approaches, about 8000 tons, has not yet been placed by the contractor.

Some Demand for Stock

Cleveland, Dec. 24.—A few jobbers and fabricators in this territory continue to inquire for fair tonnages of structural forms to round out stocks which have become depleted. Some business of this character is being closed but it is of modest volume. New rails up for bids are very light and little now is expected until after Jan. 1.

Fabricators Need Business

Pittsburgh, Dec. 24.—Outside of the requirements for the Emergency Fleet corporation and the navy department, the fabricators of steel have little business booked and need a considerable volume of new orders to fully engage mill capacity. New bridges are planned across the Allegheny at Pittsburgh, but present indications are that it will be some time before construction will begin, as the city council is moving with much caution in the matter of an appropriation. The Johnstown, Pa., city government is considering the building of a couple of bridges. Nothing else is in sight in public or private construction, and the trade is not looking for real activity until it is demonstrated that the new steel prices will hold, thus giving confidence to builders.

Mills Quote Differently

Philadelphia, Dec. 23.—A few producers continue to insist that they will ask present shape prices of 3c, Pittsburgh, on all deliveries. This is equivalent to 3.245c, Philadelphia. Other makers, however, are quoting 2.80c, Pittsburgh, or 3.045c, Philadelphia, for delivery after the present year. Very little business in structural shapes is now before eastern producers, and there have been no lettings of consequence.

Italy Wants 100,000 Tons

New York, Dec. 23.—An Italian inquiry for 100,000 tons of plain shapes is reported in the structural market here. It is thought likely in some quarters that should such business be placed it will be at around the 2.80c, Pittsburgh, figure. Included in the little buying now current for shipment abroad are several small tonnages of shapes, which went at prices ranging from 3.25c to 3.75c, Pittsburgh. Domestic inquiry continues light. It now appears that the 20 wireless towers to be erected for the government at Monroe, N. C., will be 600 feet high, in which event about 6000 tons of steel will be required. The McClintic-Marshall Co. was low bidder on a proposal recently submitted. On a lot of 1800 tons for a government warehouse at New Orleans, Levering & Garrigues were low bidders. The material for the armor plate plant at Charleston, W. Va., about 24,000 tons, remains pending.

CONTRACTS AWARDED

Warehouse for Procter & Gamble, Staten Island, N. Y., 200 tons to the Massillon Bridge & Structural Co.

CONTRACTS PENDING

Government warehouse, New Orleans, 1800 tons, Levering & Garrigue, low bidders.

Sheet Orders Are Revised

Some Makers Propose to Adjust Old Orders to New Basis in Effect Jan. 1—Some Export Business Placed

Youngstown, O., Dec. 23.—Valley sheetmakers in general are optimistic as to trade conditions next year. Some, however, do not look for a buying movement to begin until after the next three months, while others are of the opinion that January will see many domestic buyers come to the valley for all grades of sheets. Automobile manufacturers in normal times keep a year's supply of stock ahead, but for the last few months their entire output has been solely for the government and only on account of this have they been able to obtain sheets. Now that this industry again has a free rein to purchase material, many sheetmakers throughout this district expect this class of the trade to come out strongly during the fore part of January.

A difference of opinion exists among producers here as to what effect the recent price reduction had on the placing of future business. Some are inclined to believe it had a restraining effect, inasmuch as some buyers have remarked the cut in price indicated to them that makers were a little uneasy as to 1919 business. Hence buyers who take this attitude continue to hold off the placing of future business in hopes that present prices will not hold. In fact a few valley makers were recently informed that some sheetmakers intend to apply present prices to all deliveries after Jan. 1. In other words, orders now on the books which were based on government prices whether for immediate or first quarter shipment will be forwarded to the consumer at such prices as were adopted recently by sheetmakers. It is not known what policy valley producers will follow as regards this matter.

Few contracts are being placed for first quarter delivery. Specifications are coming to the mills and most of the first quarter business is being done on this basis. Export inquiries continue to come out in good-sized quantities and in some parts of the valley these are being satisfied. The inquiry from the Netherland government for corrugated and galvanized, which came out recently, has been satisfied partially, good-sized tonnages having been booked by one valley maker. Producers who have been working on Italian orders, are shipping the sheets as quickly as possible before Jan. 1, at which time the credit agreement between that country and the American government terminates.

New Business is Smaller

Pittsburgh, Dec. 24.—Makers of sheets have before them full three months' business on a basis of normally full operation and for an even longer period on the present rate of operations which in the case of the American Sheet & Tin Plate Co. is about 65 per cent and for the independents about 75 per cent. But new orders, which were fairly plentiful during the first few weeks following the signing of the armistice, have lately shrunk to rather limited proportions. The falling off in business, however, is looked upon as temporary and merely due to the fact that stock-taking time is at hand and consumers are trying to make their year-end statement as attractive as possible from a financial viewpoint.

Sheet Outlook Excellent

Chicago, Dec. 24.—Sheetmakers are at last in position to operate full capacity and find the outlook for large business is excellent. Regular users are going ahead with their manufacturing programs and specifications on contracts are coming in plentifully. After the turn of the year it is expected demand will be even better.

Switch French Bar Orders

Shell Rounds Being Displaced by Commercial Forms—Export Demand Heavy—Sharp Bar Iron Reduction Expected

Chicago, Dec. 24.—One of the interesting features of the steel bar market at present is the conversion of French contracts for shell bars into other forms, which is well under way. Already some of this has been specified to be delivered in sheets and negotiations are under way for a further tonnage being furnished in structural shapes, with bars and plates to take the place of other unfilled tonnage. This action is aiding mills greatly and the promptness with which it is being undertaken is gratifying. Specifications on existing contracts for bars are coming in well, agricultural implement, tractor and automobile manufacturers taking considerable material. Little new business is being booked for steel bars and this is natural at the inventory season. But mills have plenty of business already booked to assure operation without delay.

Western bar iron makers have outlined their recommendations as to the new price and a further meeting will be held this week to go over the entire situation and make a recommendation. The present price of 3.50c, mill, will be radically reduced, according to present information, in order to allow competition with the new price on soft steel bars. Hard steel bars rerolled from rails are in little demand and some mills are shut down for the remainder of the year because of slack business.

Dearth of New Orders

Pittsburgh, Dec. 24.—Manufacturers of merchant steel bars have comparatively little business on their books. Government orders, outside of those for navy yards and for forging purposes, were limited and outside of the makers of shafting, there were not very heavy commercial requirements to form a backlog, now that new demands are light. One Pittsburgh district manufacturer has four open-hearth furnaces and its merchant bar mill down and others are not materially better off. Makers of reinforcing concrete bars report business at a standstill, with only a few small inquiries coming out and these mostly for export and not easily filled owing to the scarcity of ship space. These hard bars have taken the full decline of $4 a ton in merchant bars. Makers of iron bars are moving slowly in the matter of prices. They claim that producing costs still are high and intimate that if the price is lowered at all, it will be less than the cut announced in steel bars. Demand for iron bars is only fair, and weakness in the scrap iron market also is a price factor that must be reckoned with sooner or later.

Export Inquiries Are Large

New York, Dec. 21.—It now is easy to buy steel bars for delivery after Jan. 1 at the reduced price of 2.70c, Pittsburgh. The mills in all cases appear to be restricting themselves, however, to taking definite orders. In no case do they seem willing to take on any first half contract business. It is believed that there will be no inclination to do any first half contracting until the new form of binding contract which now is being prepared by the committee of contract obligations of the American Iron and Steel institute, is announced. Included in the steel bar business placed during the past week was a tonnage of bars for the American Locomotive Co.

In most cases during the past six or nine months the mills have been unwilling to make shipments on usual contracts covering quarterly requirements. The business that they have booked during this time has comprised almost entirely definite orders. Hence, they are not much concerned with the question of contract cancellations. A great many consumers, however, who had placed definite orders at the 2.90c, Pittsburgh price, are endeavoring to get the mills to give them the benefit of the new price. In many cases the consumers have requested the mills to hold up shipments. Although in some cases makers have shown a willingness to compromise, where special factors such as the cancellation of government orders place the consumer in an embarrassing position, the general attitude is to hold buyers to their contracts.

Practically the only new demand for steel bars is involved in export inquiries. These embrace much tonnage in the aggregate and some of them involve singly as much as 10,000 tons. Export houses who had put these inquiries out, do not state for what countries the steel is destined and there is no assurance when the orders will be placed. On export inquiries the mills are quoting all the way from 3.00c to 3.50c, Pittsburgh, and some business is reported at 3.25c.

Take Immediate Business

Philadelphia, Dec. 23.—Some small lots of bar iron and steel bars for immediate shipment were booked in the East during the week at present prices. Most makers now are quoting the reduced schedule for new business after Jan. 1. A number of orders in bolts were taken at present prices during the past week.

Will Revise Contracts

Cleveland, Dec. 24.—Consumers of bars and other mill products in this district have been advised by some of the leading makers that shipments made after Jan. 1 against old obligations will be reduced in price to the new level now prevailing. This revision of prices applies to all bookings except where the material has been ordered against a specific undertaking the contract for which has been placed with the buyer. Not all the mills have adopted this policy and some of them continue to insist that the original prices of a booking shall apply. Not much new business is current. At the same time specifications representing new orders, substitutions and revival of old bookings, it is estimated have offset fully the cancellations in various products made in this district since the armistice was signed. The automobile builders and automobile parts manufacturers have placed most of this new tonnage. Some jobbers are inquiring to balance and extend stocks.

Bolt Outlook Good

Chicago, Dec. 24.—Every condition in the bolt and nut market is excellent and plants are operating full, with excellent order books. While routine business is furnishing a fine addition constantly the inquiries of the navy now pending promise a heavy additional tonnage for first half.

Little Doing in Shafting

Pittsburgh, Dec. 24.—These are anything but busy times for the producers of cold rolled shafting, for dullness in the products is reflected back. In the lack of some better reason, the fact that this is the stock-taking period is advanced in explanation for the dullness. Old orders hold fairly well and there is no shading of prices to bring in new ones. The base discount of 21 per cent is quoted for shipments Jan. 1, or afterward.

Shell Steel

Bought Back From British—Semi-finished Offerings Plentiful

Youngstown, O., Dec. 23.—A small tonnage of shell steel originally rolled for the British government was purchased by the maker for $29 per ton, the recent government price for heavy melting scrap. This maker took the attitude that it was better to purchase the steel than to have it thrown upon the market, a condition the shell-steel makers were anxious to avert. No change is noticed in the shell bar market. Inquiry is coming out as well as can be expected during the holiday period. Makers expect an increased demand for sheet bars after Jan. 1. One valley sheet-maker who operates his own open-hearth continues to buy sheet bars at the rate of 1000 tons per month to meet his needs.

Supplies Are Ample

Pittsburgh, Dec. 24.—Ample supplies of all kinds of semifinished steel now are available. This, however, does not mean that the supply is large, for at the moment, demands are not heavy, as few of the finishing mills are getting much new business. Users of sheet bars no longer find it difficult to secure supplies, either of bessemer or open-hearth bars. More steel is available for this purpose and while the sheet manufacturers have a big business ahead of them, new orders are fewer than they have been and tin plate requirements are so limited as to release much of the tin bar tonnages. Complaints of a shortage of billets have ceased. Wire rods are sought for export, but shipments are restricted by the lack of ship space. Domestic requirements hardly are big enough to absorb production. A less insistent demand for plates is reflected in larger slab supplies and skelp is reaching the open market in greater quan-

tities than recently, since practically the only business before integrated pipe manufacturers involves old and direct orders. Prompt shipments can be made in all lines.

Export Inquiries Active

New York, Dec. 21.—While domestic consumers of semifinished steel in this district are not showing any interest in their requirements at present, the market has a semblance of activity by reason of good sized export inquiries. Most of these involve rerolling billets, and in some cases lots as large as 5000 to 10,000 tons are wanted. Some forging billets and wire rods also are wanted. The export houses which have put out these inquiries do not name the countries for which the steel is wanted. No assurances as to when or whether these inquiries will be closed, have been given.

Old Orders

Fairly Absorb More Active Wire Capacity—Compete for Order

Pittsburgh, Dec. 24.—No special change is observed in the situation in wire and wire products. New business amounts to little but old orders are absorbing fairly well the increase production resulting from a better supply of steel. Export inquiries continue fairly numerous, especially for rods, but lack of ship bottoms is keeping actual business closely in bounds.

Bid for Fencing Tonnage

Cleveland, Dec. 24.—An inquiry for 1500 tons of galvanized wire from a fencing manufacturer remains unplaced. Competition for the business has been spirited and various quotations of 3.95c, Pittsburgh have been made but the buyer has been directing his efforts toward getting a lower price. Otherwise there is little of interest in wire products.

Copper Prices to Expire

Washington, Dec. 24.—At a meeting last week of the price fixing committee with the copper industry, Chairman Brookings of the committee explained the war industries board would cease to function Jan. 1 and all prices are being allowed to expire by limitation on Dec. 31. This action is notice that the price-fixing committee will cease to exercise any jurisdiction over copper prices after that date. Mr. Brookings called attention to the fact that among the vital war needs of the government, copper ranked second only to steel, and wished to place on record the government's appreciation of the patriotic spirit in which the copper producers had accepted maximum prices suggested by the price-fixing committee, and the industry's unceasing efforts to produce the abnormally large quantity required to supply the war needs of ourselves and those associated with us in the war. There was a hopeful expression upon the part of the producers, that the present surplus stock of copper would be soon absorbed by a large foreign demand.

Italy Wants Many Plates

Former Inquiry is Doubled to 300,000 Tons—Eastern Makers Continue to Quote Present Fixed Prices—Some Selling

New York, Dec. 21.—Ansaldo & Co., who recently inquired for 150,000 tons of plates and 50,000 tons of shapes for Italy have doubled their inquiry and now are taking bids on 300,000 tons of plates and 100,000 tons of shapes. It is expected that this inquiry will be closed at least in part when the representative of Ansaldo & Co. who has charge of this business returns to this country, which is expected to be within 30 days. Orders for 10,000 to 15,000 tons of plates have been placed by the American Locomotive Co. for delivery after Jan. 1, at the reduced base price of 3.00c, Pittsburgh. These plates will be used for the construction of 600 locomotives for the railroad administration.

Hold to Old Prices

Philadelphia, Dec. 23.—Eastern plate mills continue to quote 3.25c, Pittsburgh, or 3.495c, Philadelphia, on all deliveries for shipment to the East and are taking some business on this basis. The American Locomotive Co., it is learned, ordered steel for only 175 out of 600 locomotives. Most of this tonnage was placed with three mills at 3c, Pittsburgh, for delivery after Jan. 1. One eastern mill received a portion of this business at 3.75c, Pittsburgh, to replace an old order.

New Demands Are Light

Pittsburgh, Dec. 24.—Emergency Fleet corporation orders for plates provide the bulk of the business now before the manufacturers. One independent company reports that it has sufficient business from this source to keep it going in this department for between four and five months. Cancellations of so much government business in cars and locomotives, however, has released considerable tonnage and new demands are so light as to leave a fairly large supply on the open market. Prompt deliveries are being made, at any rate, on such new business as is developing.

Oil Trade Asks Plates

Chicago, Dec. 24.—No hesitation has been felt in the plate market, shipbuilding activity being sufficient to keep this department of mills fully active. Additionally, other demand is coming out in gratifying measure. An oil producer in the West recently placed a round tonnage here for use in fabricating storage tanks. During the war no oil was stored but this practice will be resumed, requiring much steel. Shipbuilders now buy their material without government intervention or assistance and such tonnage is receiving preferential treatment where necessary to give desired delivery.

Some Sales Made

Buffalo, Dec. 23.—Sales agencies are said to be entering some tonnage of plates for shipment after Jan. 1 at the new price. Present contracts are being shipped at the stipulated price. As to prices on material for shipment into Canada, it is not known what action will be taken. It is understood a uniform contract will be adopted by some of the leading steel companies on material for shipment after the first of the year, and which has already been contracted for. This new uniform contract has not been definitely established.

Lower Prices

Being Named by Makers of Ferromanganese and Spiegeleisen

Pittsburgh, Dec. 24.—Extreme dullness still exists in the market here for ferroalloys. Consumers generally are well covered for the present and most of them have supplies somewhat in excess of probable requirements. A number of tonnages of 50 per cent ferrosilicon are coming on the market for resale and there also are some offerings of ferromanganese and spiegeleisen from consumers who find themselves oversupplied. Attractive prices are being named on these lots, but so few buyers want supplies that even the low quotations are not productive of sales. At the moment it is not a question of prices so much as of needs. No change has been made in furnace quotations, but on resale lots the price rests largely with the buyers. Word has been received here that ferromanganese producers have decided not to make any of this alloy of higher than 70 per cent content. A price of $225 per gross ton with $3 per unit more for higher than 70 per cent now is being quoted. For 16 per cent spiegeleisen, $67.50 per gross ton is being quoted with a charge of $3 per unit for material over 16 per cent.

Need Rails for Export

New York, Dec. 21.—New demand for rails is restricted almost entirely to export inquiries. Numerous lots of standard rails are wanted principally for shipment to Cuba and South America, and inquiries involve from 1000 to 6000 tons each. As a rule, the makers are quoting $60, mill, for open-hearth rails for export. Demand for light rails is particularly good. Large tonnages of light rails are wanted for Japan and China, and mills as a rule are quoting 3.25c, on these inquiries.

To Enlarge Stack

No. 2 Haselton stack of the Republic Iron & Steel Co., Youngstown, O., will be blown out soon for relining and general repair. The furnace which is rated at 400 tons will be enlarged to a 500-ton unit.

Foreign Buyers Dodge High Orders

Export Houses Asked to Revoke Contracts for Steel and Steel Products Placed Prior to April—Goods Could be Sold at Prices Prevailing Here, But Producers Wait to See What Terms British Will Offer

How One Prominent Exporter Views Foreign Trade

THE American manufacturers of steel and steel products have a serious problem facing them when these war time demands, with this country the only source of supply, have passed and the other steel producing countries come into the market. There will have to be something besides oratory to make us certain of a goodly share of export trade when we have real competition. Up to date the manufacturers of steel and steel products have shown no inclination to look upon the export business from any other standpoint than an endeavor to make it pay a considerable premium over the current domestic prices here.

"While we were the only sellers and the export trade had to pay what was asked and do it quickly or lose the tonnage, there was no one to object and the price was paid with, generally, the harsh terms of unrevocable letter of credit established for the full amount of the order when placed. Now while this did not prevail as a 'shot gun' policy, any fair minded person would have thought that with the armistice signed and the return in the near future of competition from abroad that the desire of our manufacturers would be at once to conciliate the export trade in some measure and that prices to the export trade would be made on the same basis of price as domestic trade and credits would be made in accordance with the merits of the individual firms.

"Instead of this, in spite of very large cancellations from abroad, the manufacturers are still asking a premium of from $10 to $20 a ton on steel products and an advance of $2.25 per box over the domestic price on tin plate. Coupled with this some manufacturers have insisted upon drastic restrictions in connection with foreign orders. They would insist that orders are 'uncancellable and unchangeable in any manner after being once accepted.' And some manufacturers still ask for an irrevocable letter of credit from export firms that are financially larger than the manufacturers asking it.

"After attending export conventions and hearing oratory for days and nights at a time, going through all kinds of maneuvers to get the Webb bill passed and then afterwards finding it is not what they wanted, learned gentlemen telling us of how we can educate the American youth by a course of years of training for the foreign trade, and everyone shaking hands and going home feeling that we have the export trade in our inside pocket; now, after all this, you find the manufacturers still penalizing every endeavor to do foreign trade with high prices and unwarranted restrictions, which if kept up will kill all American export business! If this continues you won't need to have any young men for it, because there won't be any foreign trade.

"America, with its high labor charges, its ships that cost more to build than anywhere else, and its crews the highest paid in the world, has enough to overcome without any other such handicaps as being attempted at the present time by domestic manufacturers.

"Why in the name of American export trade for the future does not the manufacturer at once and with no hesitancy place export business on the same footing as domestic both as to prices and credit terms. If some concerted action is not taken in this matter and at once, we will surely reap a harvest of something that will take years to overcome."

NEW YORK, Dec. 22.—Export houses here have been receiving cancellations from abroad on steel and steel products which were contracted for in the American market prior to last April. These cancellations have come from China, Japan and South America. The foreign purchaser is taking advantage of every opportunity of relieving himself of the obligation incurred because of the high prices asked. While few new inquiries are being received, it is believed by exporters that a fair market could be had immediately for the American goods abroad if offers to sell were made at the same prices at which the same goods are being sold at in our domestic market.

One exporter cited the case of plates which were selling at $1.10 before the war. A contract for a foreign sale was placed at $12.50 prior to our entry into the war. The goods were manufactured and while in transit the government fixed the price on steel and the maximum price fixed on goods of this particular class was $3.25. At that time there was no embargo and the foreign purchaser received the shipment at $3.25 instead of $12.50 at which the manufacturer contracted to supply them, because the price agreement with our government held for all goods shipped our allies. This made the foreign purchaser feel that he had been imposed on in the first place because $12.50 had been asked.

A great bulk of the goods for which the contracts are now being cancelled from abroad, were purchased at the peak prices prevailing before the government entered into its agreement with the industry. Now foreign buyers, knowing that lower prices prevail in the American domestic market, and believing that prices may be reduced still further, are holding off and awaiting to see what terms the British are going to place on their steel. Some of the old outstanding foreign orders were cancelled last summer when the American mills were filled to capacity with government orders. Others have been held over on the books and these are the transactions which are now in question.

Ocean Freight Rates Increased

Some keen students of the market believe that the foreign purchasers have, in a few instances, acted hastily and ultimately will be forced to come back and pay even more for their supplies. Much depends upon the ability of England to produce for the foreign trade and even more depends upon the terms reached at the peace conference as to the means to be adopted for the rebuilding of the devastated area of Europe. In the meantime ocean freights on iron and steel products have advanced since the armistice owing to the abnormal demand for export tonnage of every conceivable kind. Freights from the Pacific coast to Shanghai, for instance, which have heretofore been from $35 to $40, have advanced to $45 since the signing of the armistice. Freights from New York to Shanghai have advanced from $50 to $60.

Domestic manufacturers themselves are also said to have added to the difficulty of doing business abroad by reason of the terms they are demanding. Despite the fact that the leaders in the industry have advocated a slight reduction from the fixed war prices to prevail in the domestic market after Jan. 1 next, American manufacturers are said to be demanding from $10 to $20 premium on such goods as are sold in the export trade.

This situation is causing a delay in the resumption of normal export business and some here think it will be a month or more before the market rights itself. American producers have just now a good opportunity to obtain a permanent foothold in the foreign trade if they so desire. To do this, it is said by leading export specialists, producers must offer to sell at prices they are obtaining in the domestic market, and they must be ready and willing to extend the same credits which they give freely to purchasers at home.

Uniform Steel Contract in Effect

Long-Continued Efforts of Producers to Bring About Binding Sales Instrument Results in Adoption of New Form by Leading Mills—Buyers and Sellers Are Mutually Obligated—Damages Provided

A NEW form of binding contract covering the purchases of mill products has been adopted and put in effect uniformly by a number of the leading steelmakers of the country. This important step is the result of the deliberations of the committee on contract relations of the American Iron and Steel institute covering many months which was directed at eliminating the abuses and uncommercial practices that the prevailing methods had brought about. These studies have been crystallized by the various questions with regard to the obligations of buyers and sellers which the transition of the market from a war to a peace basis has brought to the front.

The adopted contract imposes a mutual obligation upon the buyers and the sellers the violation of which shall render either party liable to liquidated damages. The buyer, under the new contract, must furnish specifications to the mill for each month's shipment on or before the first day of the month preceding that in which shipment is to be made. Failure to do so will subject the buyer to damages representing the difference between the contract price and the market price at the time of this infraction. Similarly the seller is bound to make shipments as agreed in the contract and failure to do so will impose upon him the liability of damages which will amount to the difference between the contract price and the market price at the time of such failure.

Already contracts are being negotiated under the new terms and this number will increase as fast as the new blank forms now in preparation can be supplied. The only exception to this rule is in tin plate. By reason of the fact that the buying movement in this product for delivery over the first half of 1919 is well under way the old form of contract will continue in effect up to July 1, 1919.

A complete copy of the new contract together with the conditions of sale as they apply to domestic business is given below. For export sales, a few minor alterations are made to cover shipping risks, insurance and other conditions which are peculiar to foreign trade.

SALES CONTRACT

....., 191..

..... STEEL COMPANY hereby sells and agrees to deliver, and..... ..... hereby purchases and agrees to pay for, the following material, at the prices, upon the terms here in specified, and subject to the conditions herein expressed; said material to be within the limits and sizes manufactured by the Seller and subject to the Seller's standard manufacturing variations, classifications and extras:

DESCRIPTION OF MATERIAL, QUANTITY, QUALITY AND TIME OF SHIPMENT:

PRICES:

..... base, to which will be added the Seller's regular extras, in accordance with list of Extras dated..... ..... attached hereto.

DELIVERY:

The place of delivery under this contract is f.o.b. cars at the Seller's works, ... for shipment to .....

The above prices include a freight allowance of ..... without discount, to be paid by the Buyer and deducted from face of invoice, except that no deductions for freight allowance shall be made on shipments of less than 300 pounds, nor in excess of actual weights.

TERMS OF PAYMENT:

..... Payment to be made in New York exchange or its equivalent, Freight charges to be paid in cash by the Buyer.

SPECIFICATIONS:

Specifications for material to be furnished under this contract must be furnished by the Buyer beginning not later than ....., 191—, and ending not later than ....., 191... Complete specifications for each month's shipment shall be furnished on or before the first (1st) day of the month preceding that in which shipment is to be made. The Seller shall not be obliged to accept specifications for soft or medium steel calling for less than ..... tons of any one size.

SPECIAL AGREEMENT:

The Buyer's failure to furnish specifications as herein provided shall be deemed a refusal to accept the tonnage unspecified, which thereupon shall be deducted from the contract; and the Buyer shall pay to the Seller, as liquidated damages and not as a penalty, the difference between the contract price of such material for which the Buyer has failed to furnish specifications (less freight allowance, if any) and the market value thereof at the time of such failures but such damages shall not be less than five per cent (5%) of said contract price.

If the Buyer shall have furnished complete specifications as above provided and shipments are not made by the Seller as herein agreed, the tonnage which the Seller has failed to ship shall be deducted from the contract, and the Seller shall pay to the Buyer, as liquidated damages and not as a penalty, the difference between the contract price of such material which the Seller has failed to ship (less freight allowance, if any) and the market price thereof at the time of such failure; but such damages shall not be less than five per cent (5%) of said contract price.

CONDITIONS OF SALE:

This contract is subject to the Conditions of Sale printed on the reverse hereof.

PLACE OF EXECUTION AND PERFORMANCE:

This contract shall be considered as made and to be performed in the STATE OF ..... and all questions that may arise in connection therewith shall be determined by the laws of said State.

This contract is not valid and binding upon ..... Steel Company unless signed in its behalf by its President, Vice President or General Manager of Sales.

Signed and delivered in duplicate.

..... STEEL COMPANY.

BY .....

.....

.....

BY .....

.....

CONDITIONS OF SALE

General

1. If the buyer fails to fulfill the terms of payment under this or other existing contracts between the buyer and seller, the seller may defer further shipments until such payments are made, or may, at its option, terminate this contract. The seller reserves the right, even after partial shipments on account of this contract, to require from the buyer satisfactory security for performance of the buyer's obligations; and refusal to furnish such security will entitle the seller to suspend shipments until such security is furnished or to terminate this contract. Termination of the contract under any of these conditions shall not prejudice any claim for damages the seller may be entitled to make.

Freight Rates

2. In all quotations and sales which include a freight allowance, the price or prices quoted are based on carload freight rates in effect at the date of the agreement, subject to prescribed lengths, maximum weights and minimum charges. In the event of an increase in such freight rates, the amount of such increase shall be added to the price of and to the freight allowance on all materials shipped under the increased rates; and in the event of a decrease in such freight rates, the amount of such decrease shall be deducted from the price of and from the freight allowance on all materials shipped under the decreased rates.

Sales F.O.B. Mill.

3. It is understood that f.o.b. mill means delivered free on board railroad cars at the seller's works.

Routing of Shipments:

4. The Seller is entitled to select the routing for all goods sold with freight allowance. On goods sold f.o.b. mill without freight allowance, the Buyer is entitled to select any routing officially authorized and published by transportation companies, provided he advises the Seller of such routing at the time of placing the order or specifications. The Seller reserves the right, however, to select the initial lines, if inability to secure cars promptly or other reasons would involve delay in forwarding goods over the route selected by the Buyer.

Delays in Execution of Orders or Shipment of Goods.

5-a. The Seller shall not be liable for failure to perform this contract in whole or in part, if such failure is the result of fires, strikes, differences with employes, casualties, delays in transportation, shortage of cars, and other causes beyond the Seller's reasonable control; nor shall these exemptions be limited or waived by any other terms of this contract, whether printed or written; but in the event of unavoidable delay, due to any of the above mentioned causes, the Buyer may deduct from the contract such portion of the goods already specified as are not manufactured or in the process of manufacture at the time his request to deduct reaches the Seller's works.

5-b. The Seller may ship any portion of the goods as soon as completed at the Mill, and payment for that portion of the goods shipped shall become due in accordance with the terms of payment herein specified. Insistence upon suspension of manufacture or of any shipment, may be treated by

(*Concluded on Page* 1456)

Clarke to Head Export Corporation

First Combination Under Webb Law Formed With President of Lackawanna Steel Co. at Head—Independent Steelmakers Will Seek Foreign Trade to Replace War Business

MADE possible under the Webb law, the first export combination of steelmakers has taken shape. It is an organization of a number of the larger independent companies to reach the foreign markets of the world with their products. While concentrating on war output, American steel producers have been giving careful consideration to the future of the industry. The new organization, following quickly the signing of the armistice, is significant of the importance which foreign trade has assumed. Peace has opened up the way for effort along this line, as a means of solving one of the great problems of the readjustment and reconstruction period.

Formal announcement regarding the organization of the new export company which will handle the export sales of a number of the principal independent steelmakers was made the latter part of last week. It was issued from the office of E. A. S. Clarke, president of the Lackawanna Steel Co., who will resign that position Dec. 31, to become president of the new company. A tentative statement issued Dec. 20 carried the information that the new company, formed under the provisions of the Webb act, would be known as the Independent Steel Products Corp. This has now been changed. It will be known as the North American Steel Products Corp. The announcement follows:

E. A. S. Clarke, president of Lackawanna Steel Co., has accepted the presidency of the new combination of steel producers which has been organized under the Webb bill for the advancement of American steel interests in foreign trade. Mr. Clarke, who has been the head of the Lackawanna Steel Co. since 1904, will resign as president and director of the parent company and its subsidiary corporations as of Dec. 31, 1918, and will devote his entire time to the interests of the new export company.

The North American Steel Products Corp., which will be the name of the exporting organization, will be the exclusive agency for exporting the merchant iron and steel products of the following companies, whose combined annual ingot capacity is about 12,000,000 tons: Bethlehem Steel Co., Brier Hill Steel Co., Lackawanna Steel Co., Lukens Steel Co., Midvale Steel & Ordnance Co., Republic Iron & Steel Co., Sharon Steel Hoop Co., Trumbull Steel Co., Whittaker-Glessner Co., Youngstown Sheet & Tube Co. It is expected that other steel producing interests will join the North American company later on and that eventually it will represent in export trade, substantially all important steel producing companies in the country, outside of the United States Steel Corp.

The company expects to incorporate immediately and to begin active business on Jan. 2 next. In addition to its principal office in New York City, the location of which has not yet been decided upon, it will have branches throughout the world wherever the introduction and sale of American iron and steel products make it desirable.

The launching of this company, the first to avail itself under the Webb bill of the right of producers to combine and co-operate in export trade, marks the beginning of a broad constructive work, which will benefit not only those directly interested, but the whole country; and should receive the hearty support of all who believe in the value to the United States of an increasing foreign trade in manufactured articles.

Mr. Clarke leaves the Lackawanna Steel Co. after serving it as president since Dec. 15, 1904, a little over 14 years. In that period his work in connection with the building up of the great plant at West Seneca, N. Y., with its complete facilities for ore handling, and for manufacturing pig iron and a wide variety of steel products, has made him a national figure. The Lackawanna company under his guidance has become one of the largest independent steel works in the country.

In war service as secretary of the American Iron and Steel institute's general committee on steel and steel products, Mr. Clarke has achieved another successful and satisfactory

E. A. S. CLARKE

record. That committee conducted the series of perplexing negotiations with the war industries board over each quarter's steel and iron prices since the middle of July, 1917, to the present time. It likewise compiled, co-ordinated and put into permanent form for the first time the vast volume of information covering differentials and extras that has accumulated in the last 25 years of iron and steel trading and under which the industry operated during the period of government control.

Mr. Clarke was born in Ottawa, Ont., in January, 1862. He is a graduate of Harvard, having gained his A.B. degree in the class of 1884. Immediately following his graduation, he entered the employ of the Spang Iron & Steel Co., Sharpsburg, Pa., in the laboratory department under Robert Forsythe, who then was general manager of the company.

Less than a year later he went to the Union Steel Co., at Chicago, with Mr. Forsythe, working first in the laboratory and later in various parts of the mills until March, 1890, when he was appointed assistant superintendent of the Union works. In 1895 he became general superintendent of the South works of the Illinois Steel Co., which had by that time been acquired by the Union Steel Co. Three years later he rose to the position of general manager of the Illinois Steel Co.

After about one year Mr. Clarke resigned to become general manager of manufacturing of the Deering Harvester Co. and upon the formation of the International Harvester Co., he was made general manager of manufacturing of that important interest. In the fall of 1904 he left the Harvester company to become president of the Lackawanna Steel Co.

Vice President to Fill Vacancy

In all probability Charles H. McCullough Jr., vice president and general manager of the Lackawanna Steel Co., will be promoted to succeed Mr. Clarke in the presidency. He has been with the company in the capacities of vice president and general manager since 1905, coming from the Illinois Steel Co. He was born in Philadelphia on Christmas day, 1868, and was educated at Stevens Institute of Technology, Hoboken, N. J., being graduated in 1891 with the degree of mechanical engineer. Immediately after graduation, he secured employment at the South Works plant of the Illinois Steel Co., with which company he remained until 1905, rising by successive promotions to the position of second vice president.

It was due in large measure to Mr. McCullough's managerial ability that the Lackawanna Steel Co. made such an enviable record during the war in the production of steel. Next to the Schneider works at Creusot, France, the Lackawanna company was the greatest factor in providing ordnance and munitions for the French army. Every facility of every department was employed by him in utilizing to full advantage the output of the company's nine blast furnaces. A message was received a short time ago from Monsieur Theodore Laurent, managing director of the Compagnie des Forges & Acieries de la Marine & d'Homecourt, thanking the company for its support. He was one of the first to convert rail mills successfully to the rolling of shell rounds.

CHARLES H. McCULLOUGH JR.

American Contracts

With British Ordnance Makers Are Being Adjusted Rapidly

(*Staff Correspondence*)

London, Nov. 29.—The American army is cancelling its ordnance contracts in Great Britain as rapidly as possible and it can now be stated that this business was considerable, specially for artillery on account of England's highly developed gun forging and finishing facilities. One plant alone in Scotland had contracts for over 700 heavy U. S. field guns.

The total volume of these contracts, while large, was small in comparison with Britain's production. Therefore it is thought the rapid withdrawal of American orders will have no appreciable effect on the general labor situation in the British Isles. The American contracts are being adjusted with the manufacturers by agreement, each contractor being paid any damages incurred by the sudden stoppage of the work.

It is not yet known what the American army will do with its partly manufactured equipment. In fact an inventory of completed items and semimanufactured material must be taken before a definite policy can be determined upon. On account of the exigencies of war, the American army, according to officers in London, purchased huge quantities of equipment without going through the usual red tape. For this reason the records must be gone over carefully before it can be determined what material is on hand, where it is and whether to sell it to Great Britain, ship it home or scrap it.

The Lochiel furnace of Edward E. Marshall, Philadelphia, is entering on its sixteenth month of continuous operation in the production of ferromanganese. The company believes this establishes a world's record, and certainly a new mark in American practice.

Redraft Law to Pay Bills

Government Given Additional Protection by Measure as Revised to Adjust Claims

WASHINGTON, Dec. 24.—The administration bill to provide relief where formal contracts for war requirements were not made as required by law has been redrafted and introduced in the house by Representative Dent, chairman of the committee on military affairs. Essentially, the new bill is similar to the original, but carries certain additional features to meet opposition with regard to the former bill and to make the interests of the war department more secure. The draft as reported favorably by the house committee, like the original bill, empowers the secretary of war to adjust, pay, or discharge obligations incurred in connection with informal agreements "upon the basis of a reasonable value." According to a statement by Maj. Gen. George W. Goethals, director of purchases, these informal agreements total 6679 and involve $1,675,951,297.76, which is about half again as large as was estimated previously.

Where no property has been transferred, delivered, or accepted payment shall not be in excess of the cost incurred in preparation for performance as determined by the secretary of war. The secretary is required to report to congress at the beginning of its next session following June 30, 1919, a detailed statement showing the nature, terms and conditions of every such agreement and payments authorized.

Additional Safeguards Provided

Further provision is made that nothing in the proposed act shall be construed to confer jurisdiction on any court to entertain suit against the government, nor would the government be barred from reviewing any settlement made or prevented from recovering any money, if defrauded.

The final provision in the bill makes it necessary that the names of contractors and the amount paid each in connection with the informal agreements be filed with the clerk of the house for the information of congress and printed in the *Congressional Record*, or in the *Official Bulletin*, 10 days before confirmation and payment is authorized. In a memorandum submitted to Representative Dent by G. H. Dorr, assistant director of munitions, it is stated that as progress is made in working out proper adjustments lists of such agreements will be compiled.

In the memorandum, Mr. Dorr gives typical cases of contractors, who had entered into informal agreements, being left in an embarrassing position through the cancellation of the contracts. Reference is made of an instance wherein an award for 5000 frames for army trucks was made on Oct. 3, 1918, with the statement to the manufacturer that "formal contract will follow." On Oct. 11, the department pressed for speedy production and the manufacturer proceeded with the work, making expenditures of more than $500,000. The armistice was signed prior to the execution of a formal contract, and in the absence of the necessary legislation, an adjustment cannot be made. This situation has left many contractors to face bankruptcy unless speedy adjustment is made. Mr. Dorr says manufacturers have a part, and, in many cases an essential part, of their working capital tied up in expenditures made in preparing to begin work. He explains that the problem presented to the war department of the adjustment of agreements informally made is of the same character as that presented where formal valid contracts were made. The machinery set up for this adjustment was explained fully in THE IRON TRADE REVIEW of last week.

Would Not Penalize Patriotism

Yielding to the exigencies of the war situation, Mr. Dorr states that contractors with these informal agreements put the work of production ahead of the work of negotiation and often put themselves in a position where their only reliance was the good faith and fairness of the government in finally fixing the terms of the agreement.

"For example," Mr. Dorr continues, "in the manufacture of a certain important type of gun, it was thought impracticable to determine the proper price basis at the time the order for the production of the gun was given, as there was insufficient experience as to what the cost of the manufacture would be and the determination of the price; and so the final execution of the formal contract was left until there would be sufficient actual manufacturing experience for the government to make a proper determination as to price. Further, there are a number of instances where the government, in execution of its plans for the erection of a munition plant or the creation of a cantonment, induced the occupants of land to vacate it and go to considerable expense without any agreement as to compensation for the purchase or use of the land having been actually reached."

Patriotism of those who in the exigencies of the war went ahead to produce instead of waiting to bargain should not be penalized, he concludes.

What Amended Bill Authorizes

BE it enacted by the senate and house of representatives of the United States of America in congress assembled: That the secretary of war be and he is hereby authorized to adjust, pay, or discharge any agreement, express or implied, upon the basis of reasonable value but in no case greater than the agreed price, that has been entered into in good faith during the present emergency and prior to Nov. 12, 1918, by any officer or agent acting under his authority, direction, or instruction, with any person, firm, or corporation for the acquisition of lands, or the use thereof, or for any supplies, material, or equipment to be used in the prosecution of the war, when such agreement has been executed in whole or in part, or expenditures have been made or obligations incurred upon the faith of the same by any such person, firm, or corporation prior to Nov. 12, 1918, and such agreement has not been executed in the manner prescribed by law."

Iron is Resold

Pittsburgh, Dec. 24.—A Pittsburgh district steel company has during the past week been rather free seller of basic pig iron and has not been obtaining much more than the price suggested by Judge Gary at Washington recently. The iron involved was allocated to this company while it had, and was still getting, government orders. With the conclusion of hostilities, it had unfilled orders cancelled and found itself bound to take a considerable tonnage for which it would not have use. Efforts to secure a cancellation of the iron were unavailing. Brokers are making a good many inquiries for iron for first quarter and half of 1919 delivery. One such inquiry is for 3000 tons of basic and 1000 tons of malleable for first quarter.

Uniform Steel Contract

(*Concluded from Page* 1453)

the Seller as a wrongful termination of the contract on the part of the Buyer; and the Buyer shall thereupon be liable for all damages arising out of such termination.

Inspection.

6. Inspection and acceptance must be made at the manufacturer's works and shall be final. Reasonable facilities will be afforded inspectors representing the buyer to inspect material and to apply, before shipment from the works, tests to which the seller has previously agreed.

Guarantee.

7. The seller agrees to replace steel proved to be defective in manufacture or unfit for the purpose for which it is sold, provided such steel is yet in the hands of the buyer and the quality and purpose are stated in the contract; but the seller will not pay any claims for labor on such steel nor for consequential damages. In all cases full opportunity shall be given for investigation by the seller's representatives. Goods must not be returned except by written permission of the seller.

Shortage.

8. The quantity of material shown on invoice shall in all cases govern settlements. Claims for errors, deficiencies, or imperfections will not be entertained by the seller unless made with reasonable promptness after receipt of goods.

Damage in Transit.

9. The seller agrees that the goods shall be delivered to the transportation company in good condition, and the buyer assumes all risk of rust, delay, loss or damage during transportation.

Agreements.

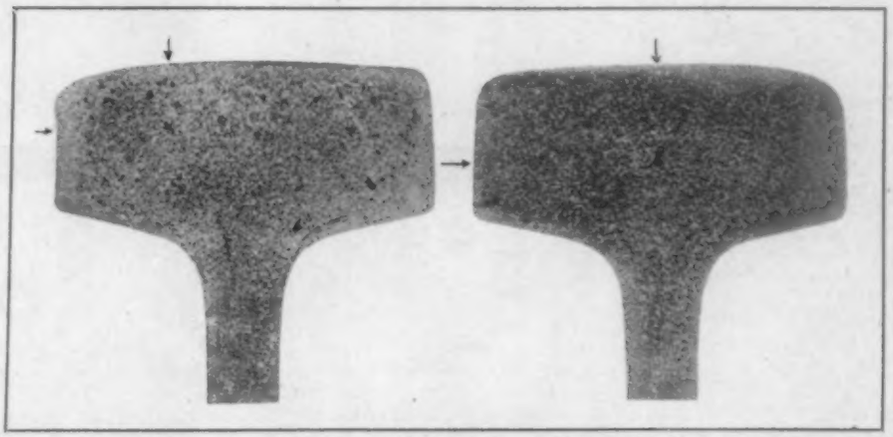
10. There are no understandings or agreements relative to this contract that are not fully expressed herein, and no changes shall be made in this contract unless reduced to writing and signed by both parties.

Reheating as Cure for Rail Fissures

Tests With New Cupric Chloride Etching Reagent Seem to Support Theory That Transverse Failures Are Due to Defect in the Steel—Reheating of Blooms Will Diffuse Bands of Phosphorus

BY G. F. COMSTOCK

THE subject of transverse fissures in steel rails has been discussed thoroughly in recent years from various points of view and the final opinions expressed may be classified into two groups. That these fissures are the result merely of fatigue of the steel and are independent of the quality of the metal and, the other, that the quality of the metal and the mill practice must have something to do with them.



FIGS. 1 AND 2—SULPHUR PRINTS OF RAILS THAT FAILED FROM TRANSVERSE FISSURES. ARROWS POINT TO NUCLEUS IN CROSS SECTION

The view that these fissures were due merely to normal fatigue under alternating stresses seemed most reasonable to the writer until quite recently, because in the vast majority of cases no structural differences were found between metal at the nuclei of transverse fissures and metal at similar positions in the same rails or in other rails that had not developed fissures. Within the last year or two, however, since the method of etching polished sections for the microscope with a cupric chloride solution has been tried systematically on lengthwise sections, passing through the nuclei of transverse fissures, evidence began to accumulate that there was a certain structural peculiarity of the metal associated with these fissures, often showing its most distinct development at the nucleus rather than elsewhere in the section examined. So far as the writer is aware, this particular method of examination has not been used by other workers who have published results of metallographic investigations of transverse fissures. The cupric chloride reagent as used by the writer was made by dissolving 2.5 grams of cupric chloride and 10 grams of magnesium chloride in 5 cubic centimeters of hydrochloric acid and the smallest possible quantity of hot water, and diluting with alcohol to 250 cubic centimeters. Its action on a polished steel surface consists in depositing a film of copper quickly on normal metal, while metal higher in phosphorus remains bright for a longer time. Thus if the action is not continued too long, the location of high-phosphorus areas on a polished section can be shown clearly as bright spots on a darker background. Silicon, chromium, nickel, copper and other elements existing in solid solution in the steel show effects similar to phosphorus under the action of this reagent, but in general the effect is most important and most commonly encountered in its detection of phosphorus. The pattern developed by this etching may be made more distinct by dissolving off the deposited copper with ammonia but this procedure was not followed by the writer in any of the work done on transverse-fissure rails and the etching was always continued to the same point, as far as could be judged, so that a true comparison in contrasts between different samples was maintained. The effect of the cupric chloride etching on the samples was checked by repolishing and etching again with a 0.5 per cent solution of picric acid in water. This solution darkened the high-phosphorus areas, leaving the normal metal bright, but it was not so easy to use as the cupric chloride and more apt to act irregularly and show peculiar curved markings not duplicated after repolishing and etching.

Through the courtesy of several railroad companies many opportunities were afforded during the past six years for investigating the structures of rails that had failed from transverse fissures. At first, when the usual methods of examination were used, such as the making of sulphur prints, examining polished sections for nonmetallic inclusions, and sections etched with picric acid or alkaline sodium picrate for the carbon distribution and microstructure, no structural differences were found in the large majority of cases between the metal at the nuclei of fissures and that at similar positions in the rail section where fissures had not developed. There were, of course, a few exceptions where the origin of the fissure could be definitely traced to segregated streaks in the steel,

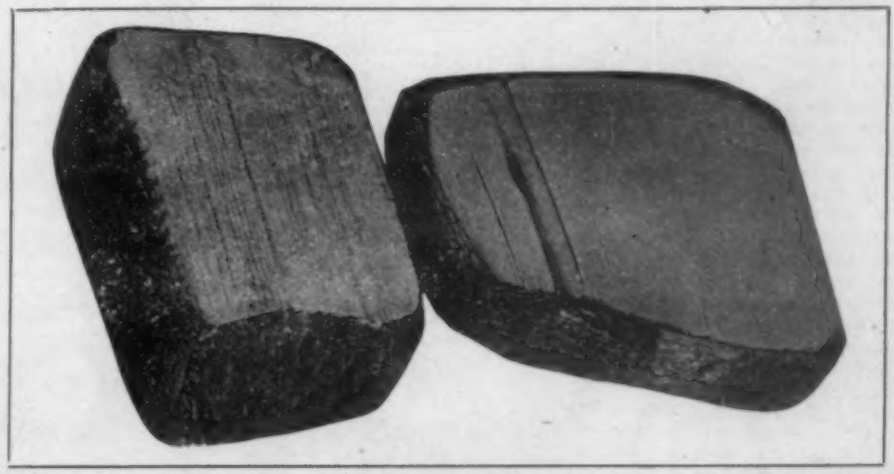


FIG. 3—SPECIMENS ETCHED WITH AQUEOUS PICRIC ACID, SHOWING PARTS OF TRANSVERSE FISSURES ON THEIR EDGES

From a paper to be presented at the February, 1919, meeting of the American Institute of Mining Engineers at New York. The author, G. F. Comstock, is associated with the Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

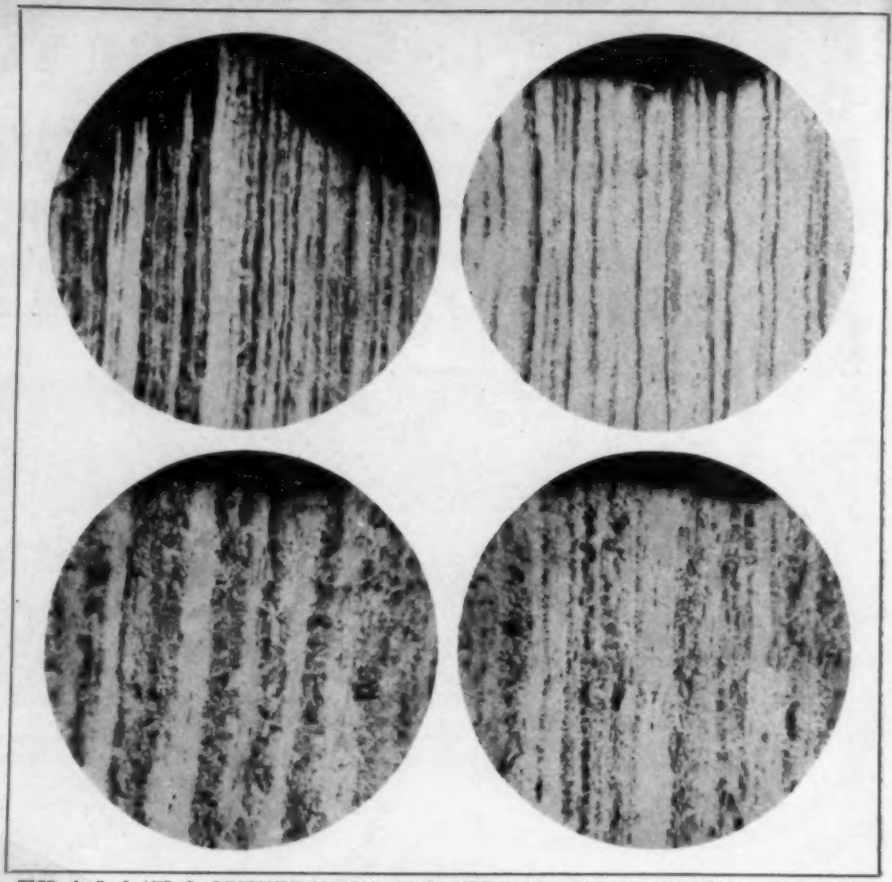
cases being generally among those in which the transverse fissure had developed from a longitudinal crack. The two sulphur prints shown in Figs. 1 and 2 are illustrations of the exceptional cases where the nuclei of transverse fissures were located directly in segregated streaks that caused dark spots on these prints.

When the use of cupric chloride reagents was discovered and advocated for the detection of phosphorus segregation in steels and this method began to be applied to longitudinal sections cut through the nuclei of transverse fissures in rails it was found in many cases that the most distinct of the streaks shown in this way passed through the nucleus. In some of these rails the streaks were about the same throughout the section examined but in practically none were they absent or even indistinct. Fig. 3 is a photograph of two polished microscope specimens etched with the aqueous picric acid solution. The edges of these specimens show parts of transverse fissures, with the polished sections cutting through the nuclei, and in each case it is plainly seen that the nucleus of the fissure is directly in line with the most distinct dark streak on the polished surface. Figs. 4, 5, 6 and 7 are photomicrographs of the polished surfaces of specimens cut, like those in Fig. 3, through the nuclei of transverse fissures in rails, but etched with cupric chloride. Each of these shows the edge of the specimen at the nucleus of the fissure, and the most distinct high-phosphorus streaks are shown in every case passing directly into these nuclei. Figs. 8 and 9 are similar photomicrographs of other rails that showed longitudinal cracks running through the streaks in line with the transverse fissures. Fig. 9 shows also a transverse crack which was about 5/16 of an inch from the fissure and in the same segregated streak as its nucleus.

Determining Cause of Streaks

Having seen how high-phosphorus streaks were found associated with transverse fissures in all rails that failed in this way and that were examined with reference to such streaks it was of interest to look into their causes and determine whether they necessarily exist in all rails or merely in rails subjected to certain conditions of manufacture. If a definite cause for the streaks can be established, and if some rails can be found without them, it should be easy to show definitely whether or not they really have any connection with the formation of transverse fissures.

The cause of the irregular effect of the cupric chloride and aqueous picric acid solutions on polished steel samples has been demonstrated to be due to the irregular distribution, chiefly of phosphorus, but partly of other elements in solid solution in the steel. By the well known process of selective freezing which steel ingots undergo after they are poured the purer metal forms solid dendrites or "pine-tree" crystals in the liquid metal, which then contains more than its share of the carbon, phosphorus, etc. On cooling further, the dendrites increase steadily in bulk while the remaining liquid decreases and at the



FIGS. 4, 5, 6 AND 7—PHOTOMICROGRAPHS OF LONGITUDINAL SECTIONS OF RAILS AT THE NUCLEI OF TRANSVERSE FISSURES, ETCHED WITH CUPRIC CHLORIDE

Table I

Description of Samples

Sample No.	Mill	Lb. per yd.	Rail Letter	Method of Rolling	Service in Track
1	A	80	...	Probably direct from ingot.	Failed, transverse fissure.
2	A	90	F	Probably direct from ingot.	Failed, transverse fissure.
3	C	85	...	Probably direct from ingot.	Failed, transverse fissure.
4	A	80	...	Probably direct from ingot.	Failed, transverse fissure.
5	A	90	F	Probably direct from ingot.	Failed, transverse fissure.
6	A	80	...	Probably direct from ingot.	Failed, transverse fissure.
7	B	100	A	Direct from ingot.	Failed, transverse fissure.
8	B	100	A	Direct from ingot.	Failed, transverse fissure.
9	C	105	A	Direct from ingot.	Failed, transverse fissure.
10	C	105	D	Direct from ingot.	Failed, transverse fissure.
11	C	105	A	Direct from ingot.	Failed, transverse fissure.
12	C	105	A	Direct from ingot.	Failed, transverse fissure.
13	C	100	E	Direct from ingot.	Failed, transverse fissure.
14	B	100	A	Direct from ingot.	Failed, transverse fissure.
15	C	100	C	Direct from ingot.	Failed, transverse fissure.
16	B	105	C	Direct from ingot.	Failed, transverse fissure.
17	B	80	C	Direct from ingot.	Failed, transverse fissure.
18	C	100	E	Direct from ingot.	Failed, transverse fissure.
19	B	80	E	Direct from ingot.	Failed, transverse fissure.
20	C	100	B	Direct from ingot.	Failed, transverse fissure.
21	C	105	D	Reheated bloom.	Failed, transverse fissure.
22	B	100	B	Direct from ingot.	Failed, transverse fissure.
23	C	100	B	Direct from ingot.	Failed, transverse fissure.
24	B	80	C	Direct from ingot.	Failed, transverse fissure.
25	D	100	B	Reheated bloom.	Good service.
26	C	105	D	Reheated bloom.	Good service.
27	C	105	B	Reheated bloom.	Good service.
28	E	100	...	Reheated bloom.	Good service.
29	E	100	...	Reheated bloom.	Good service.
30	E	100	...	Reheated bloom.	Good service.
31	B	100	C	Direct from ingot.	Good service.
32	B	100	B	Direct from ingot.	Good service.
33	D	100	...	Reheated bloom.	Good service.
34	C	105	C	Reheated bloom.	Good service.
35	D	100	E	Reheated bloom.	Good service.
36	D	100	C	Reheated bloom.	Good service.

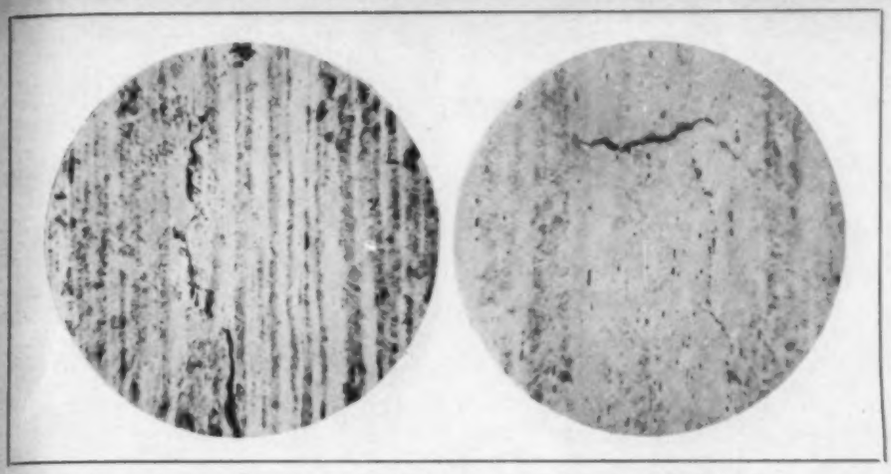


FIG. 8—LONGITUDINAL CRACK CONNECTED WITH TRANSVERSE FISSURE IN SPECIMEN ETCHED WITH CUPRIC CHLORIDE. FIG. 9—LONGITUDINAL AND TRANSVERSE CRACK IN SEGREGATED STREAK IN WHICH NUCLEUS OF TRANSVERSE FISSURE WAS LOCATED

same time becomes more and more saturated with impurities. Thus the ingot when first frozen is far from homogeneous and can become so only by diffusion in the solid state. This takes place to some extent in the soaking pits, especially in regard to carbon, which becomes thoroughly diffused much sooner than phosphorus, according to some authorities. When the ingot is rolled out into a rail any irregularities in composition are rolled into streaks, and instead of a dendritic structure, the result is a lamination. Since the carbon usually becomes thoroughly diffused in the soaking pit the laminations do not appear in the ferrite-pearlite structure, but since phosphorus diffuses slowly the laminated structure may often be expected to show in the finished rail when treated in such a way as to reveal the distribution of this element.

Every ingot when first cast is chilled quickly on its outside by the cold mold with which it is in contact and hence its outer skin is nearly homogeneous and free from coarse dendrites, segregation, etc. For this reason the outer surface of a steel rail is always free from high-phosphorus streaks to a greater or less depth. Transverse fissures generally have their nuclei a short distance inward from the surface of the rail section and it has often been noted that the nucleus will occur at the same distance below the top of the head as the topmost distinct high-phosphorus streak. This streak would be subjected to a greater bending moment in service than any streak existing nearer the center of the rail and hence might be expected to crack first.

Advantage of Reheating

The cause of the high-phosphorus streaks has been seen to be selective freezing in the ingot which cannot be avoided by any means now known. The effect of this selective freezing may, however, be remedied or overcome by diffusion in the solid state, which is a slow process in regard to phosphorus. If longer heating of the solid steel in rail manufacture, by allowing more thorough diffusion, will decrease the intensity or distinctness of the high-phosphorus streaks then rails rolled from reheated blooms should show these streaks less distinctly than rails rolled direct from ingots. A more interesting fact in this connection is that out of the few hundred rails that have failed from transverse fissures on the New York Central lines just two of them had been rolled from reheated blooms. If it could be shown, therefore, that rails rolled from reheated blooms had the high-phosphorus streaks less in evidence than direct-rolled rails, a strong support would be secured for the theory that these streaks had some influence on the origin of the fissures.

To investigate this point, 24 samples of rails were secured through the co-operation of the New York Central lines, 12 of which had failed from transverse fissures, while the others had given good service in track. All but one of the former had been rolled direct from ingots and all but two of the latter had been rolled from reheated blooms. Twelve samples of rails that had failed from transverse fissures and that had been previously received from various sources were also employed in this investigation, making 24 transverse-fissure rails and 12 good service rails. Data received from the senders regarding these samples are shown in Table I. Unfortunately data as to the amount and character of service endured by the various samples are not at hand and the method of rolling of the first six samples is not positively known, although there is little doubt that all were rolled direct. These samples represent different heats of steel with the following exceptions: No. 5 belonged to the same heat as No. 2; Nos. 7 and 8 were both from another

Table II

Results of Examination of Samples

	Quality in regard to				Amount of free		Quality in regard to streaks shown by etching with	
Sample No.	Sulphur print	Presence of alumina	Presence of slag	Distribution of sulphides by microscope	Ferrite	Cementite	Cupric chloride	Aqueous picric acid
1	Good	Poor	Good	Fair	Little	None	Bad	Poor
2	Good	Bad	Good	Fair	Traces	None	Bad	Bad
3	Good	Poor	Fair	Good	None	None	Poor	Bad
4	Fair	Good	Bad	Good	Little	One streak	Bad	Bad
5	Fair	Bad	Good	Fair	Little	None	Bad	Poor
6	Poor	Bad	Good	Poor	Traces	Considerable	Poor	Poor
7	Fair	Good	Good	Fair	Traces	None	Fair	Poor
8	Fair	Good	Good	Poor	None	None	Poor	Poor
9	Poor	Good	Fair	Poor	None	One streak	Bad	Bad
10	Good	Good	Good	Fair	None	None	Poor	Fair
11	Good	Good	Good	Poor	None	None	Bad	Bad
12	Good	Good	Poor	Good	Traces	None	Bad	Bad
13	Good	Poor	Good	Poor	None	None	Bad	Bad
14	Fair	Good	Good	Fair	Traces	None	Bad	Poor
15	Good	Good	Poor	Fair	None	None	Bad	Bad
16	Good	Good	Poor	Fair	Little	None	Bad	Poor
17	Good	Good	Good	Fair	Traces	None	Poor	Poor
18	Good	Poor	Good	Good	Little	None	Bad	Bad
19	Good	Good	Good	Fair	Little	None	Poor	Fair
20	Fair	Good	Good	Good	None	One streak	Fair	Fair
21	Good	Good	Good	Fair	None	None	Good	Good
22	Good	Good	Good	Fair	Traces	None	Bad	Bad
23	Good	Good	Good	Poor	Traces	None	Bad	Bad
24	Good	Poor	Good	Poor	Traces	None	Poor	Poor
25	Good	Good	Good	Fair	Traces	None	Good	Fair
26	Good	Good	Good	Fair	Traces	None	Fair	Fair
27	Good	Good	Good	Fair	Traces	None	Good	Good
28	Poor	Good	Good	Fair	Traces	None	Poor	Fair
29	Bad	Good	Good	Poor	Little	None	Bad	Bad
30	Fair	Good	Good	Poor	Traces	None	Fair	Poor
31	Good	Good	Poor	Poor	Much	None	Bad	Bad
32	Good	Good	Good	Poor	Much	None	Bad	Bad
33	Good	Good	Poor	Good	Little	None	Fair	Good
34	Poor	Poor	Good	Good	Little	None	Good	Good
35	Good	Good	Good	Fair	Traces	None	Poor	Bad
36	Fair	Good	Good	Good	Traces	None	Good	Fair

heat; Nos. 11 and 12 likewise, and also Nos. 33 and 35.

Since the unit for this work seems properly taken as the ingot, with its particular time of heating, it did not appear necessary that each sample should represent a separate furnace charge even though the results were to be finally averaged for each class of steel. The samples of rails that failed represented heats that had produced anywhere from one to ten transverse-fissure rails. No. 21 was one of the two rails rolled from reheated blooms that failed in this way.

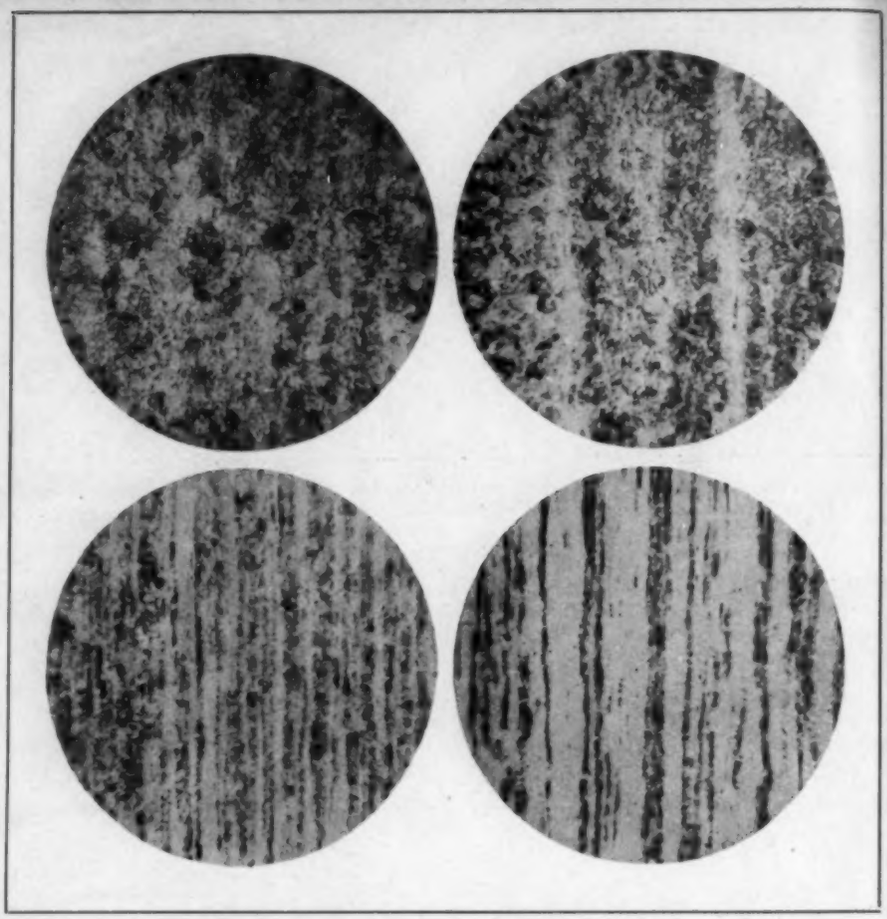
Table II gives the results of the metallographic examination of these samples. The first thing done to each sample was the making of sulphur prints from a cross section generally within an inch or two of the transverse fissure, provided it appeared on the sample received. These prints were classified as good, fair, poor or bad according to the amount of segregation shown. Fig. 1 shows a print from sample No. 9, classed as poor, while Fig. 2 shows one from sample No. 14, classed as fair. Those classed as good showed less segregation than the latter and those classed as bad showed more than the former.

The samples were next repolished and etched with cupric chloride reagent and were classified in the same way as the sulphur prints, according to the quality of the metal judged from the distinctness of the streaks shown. Figs. 10, 11, 12 and 13 illustrate the terms used in describing the quality after this etching. Finally the samples were all repolished again and etched for 15 to 20 seconds with aqueous picric acid solution and graded as before. Figs. 14, 15, 16 and 17 illustrate the significance of the terms for this grading.

Results are Averaged

In Table III these results are all averaged for the rails that failed from transverse fissures and for those that endured good service without failure to get the average classification of each kind of rails with respect to the different characteristics that were examined. For instance, in regard to sulphur prints, out of 24 transverse-fissure rails 16 were classed as good in this respect, or 67 per cent; six were classed as fair, or 25 per cent; and the remainder, or 8 per cent, as poor. The classification of direct-rolled rails was practically the same as that for the transverse-fissure rails and the rails rolled from reheated blooms were also similar to the good-service rails, so that it did not seem desirable to fill out the last two columns of the table except in regard to the high-phosphorus streaks.

The data given in the columns headed "amount of free ferrite" and "cementite" were obtained by examination of the sections after etching with the usual alcoholic solution of picric acid, and in cases where the presence of cementite was indicated this was checked by repolishing and etching with boiling alkaline sodium picrate. The term "one streak" in this connection does not mean that only one particle of free cementite was seen in the section but that there was in the sample one segregated streak containing an appreciable net-

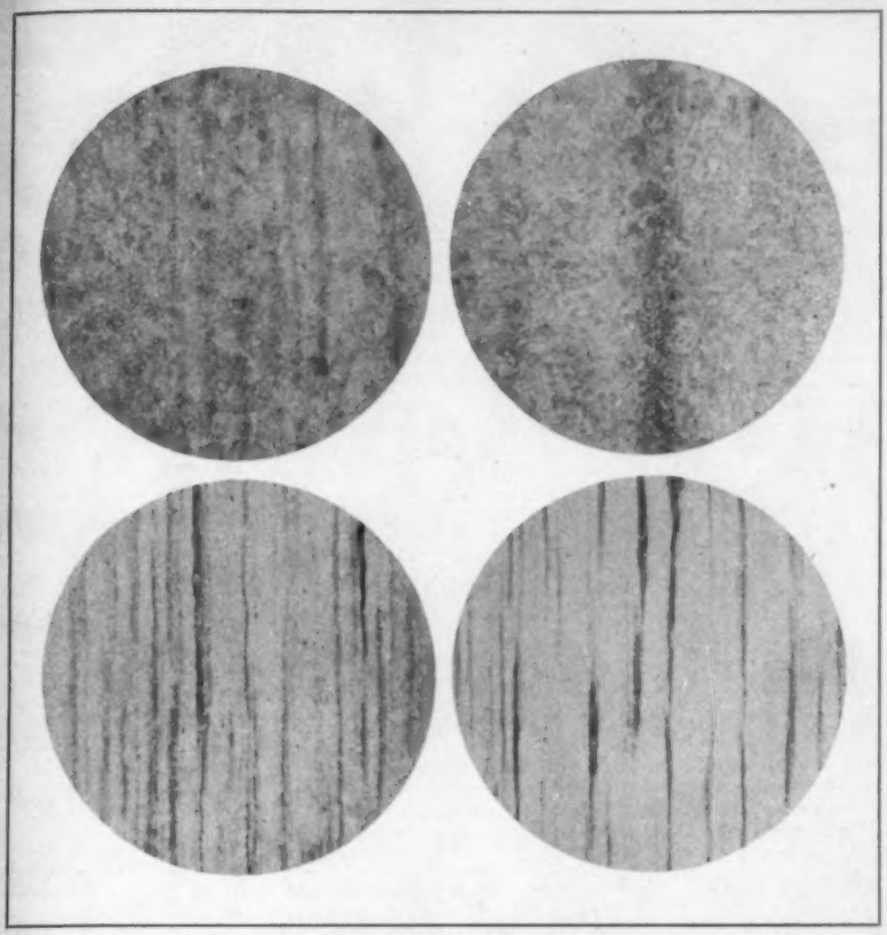


FIGS. 10, 11, 12 AND 13—PHOTOMICROGRAPHS OF LONGITUDINAL SECTIONS OF RAIL HEADS ETCHED WITH CUPRIC CHLORIDE, ILLUSTRATING TERMS USED IN DESCRIBING SPECIMENS WITH REGARD TO HIGH-PHOSPHORUS STREAKS

Classification of Samples

Table III

In regard to	Grade	Transverse-fissure rails per cent	Rails that gave good service, per cent	Rolled direct from ingot, per cent	Rolled from reheated blooms per cent
Sulphur print	Good	67	58		
	Fair	25	17		
	Poor	8	17		
	Bad	..	8		
Presence of alumina	Good	67	92		
	Poor	21	8		
	Bad	12			
Presence of slag	Good	75	83		
	Fair	8			
	Poor	13	17		
	Bad	4			
Distribution of sulphides by microscope	Good	21	25		
	Fair	50	42		
	Poor	29	33		
Amount of free ferrite	None	38			
	Traces	37	58		
	Little	25	25		
	Much	..	17		
Amount of free cementite	None	83	100		
	One streak	13			
	Considerable	4			
Cupric chloride etching	Good	4	33	..	46
	Fair	8	25	11	27
	Poor	29	17	26	18
	Bad	59	25	63	9
Aqueous picric acid etching	Good	4	25	..	36
	Fair	12	33	16	36
	Poor	38	9	32	10
	Bad	46	33	52	18



FIGS. 14, 15, 16 AND 17—PHOTOMICROGRAPHS OF LONGITUDINAL SECTIONS OF RAIL HEADS ETCHED WITH AQUEOUS PICRIC ACID, ILLUSTRATING TERMS USED IN DESCRIBING SPECIMENS WITH REGARD TO HIGH-PHOSPHORUS STREAKS

work of free cementite between pearlite grains.

In Table III it is readily seen that the majority of both the failed and the good rails were classed as good in regard to sulphur prints, presence of alumina and presence of slag and as fair in regard to distribution of sulphides, with either no ferrite or only traces and with practically no cementite. Of course, there are slight differences in these respects and the rails that failed are seen to average better in regard to sulphur prints, worse in regard to alumina and slag inclusions, and to have, on the average, less ferrite and more cementite than the good rails.

The showing in regard to sulphur prints should not be taken to mean that rails showing segregation in these prints are more apt to give good service than rails of which the sulphur prints are good, for this investigation was concerned with only one particular type of rail failure, and there is no question whatever about segregated rails being especially susceptible to another type of failure known as a "split head".

The results show, however, that segregated sulphides are not a cause of transverse fissures. In regard to alumina inclusions the results might be considered as indicating that these have some effect on the fissures were it not for the fact that no case has arisen where a streak of alumina particles was found in line with and close to the nucleus of a fissure. The showing in regard to free ferrite and cementite is merely a corroboration of the fact stated several times by other writers that transverse fissures occur most frequently in hard high-carbon rails. The indication is worth noting, however, that a thick ferrite network in the microstructure seems to mean less tendency toward the formation of fissures, while cementite-bearing streaks in the head mean a greater tendency toward their development.

Striking Comparison Made

The various aspects of the structure so far considered in Table III have given, for the two kinds of rails, classifications that were similar in their general indications, showing that none of these peculiarities could be an important cause of transverse fissures. The last two criteria, however, show a decided difference in the classification figures for the two kinds of rails, and indicate that there is here at least some relation between these aspects of the structure and the formation of the fissures. Thus, while 88 per cent of the rails that failed were classed as poor or bad in regard to the high-phosphorus streaks shown by the cupric chloride etching, only 42 per cent of the good-service rails were so classed and the aqueous picric acid etching checked these figures in almost the same way.

Comparing the direct-rolled rails with the rails rolled from reheated blooms the figures are more strongly suggestive, becoming 89 and 88 per cent, respectively, for the sum of the poor and bad classes of the direct-rolled rails after the two methods of etching, and only 27 and 28 per cent for the same classes of the rails rolled from reheated blooms. In obtaining these average classification figures for direct-rolled rails, samples Nos. 1 to 6, inclusive, had to be omitted on account of the slight uncertainty regarding their method of rolling, but on the 30 samples of which the method of rolling is known without doubt, the cupric chloride etching shows regularly increasing percentages from the good to the bad classes for the direct-rolled rails, while the percentages regularly decrease from good to bad for the rails rolled from reheated blooms. The aqueous picric acid etching checks these figures fairly closely. Here is, then, a clear indication that reheating the blooms in rail manufacture will give a product decidedly more free from high-phosphorus streaks than the direct-rolling process will give, and it has also been shown that rails can be made, and are made, that are practically free from these streaks, as shown in Figs. 10 and 14.

The inclusion of samples Nos. 1 to 6 among the direct-rolled rails, where they belong in all probability, would alter the figures in the third column of Table III to only a slight extent. The difference between the classification in the first two columns of this table and that in the last two columns is due, as shown in Table I, largely to three samples, Nos. 21, 31 and 32. The former, as stated before, is one of the two rails that were rolled from reheated blooms that have failed from transverse fissures on the New York Central lines and hence is an exceptional case. The other two, both from the same mill, were rolled direct from the ingots and showed very distinct high-phosphorus streaks, yet gave good service without developing fissures.

As shown in Table II, these two rails are the only ones in the entire series that showed much ferrite in their microstructures and indeed they had every appearance of being bessemer steel, although reported as open hearth. It may be that the presence of the thick ferrite network helped these rails to resist the development of fissures despite their high-phosphorus streaks, and this may likewise be the reason why bessemer rails in general do not develop transverse fissures despite the streaks which would be expected from their higher content of phosphorus.

If these two rails were considered as exceptional, on account of being lower in carbon than all the other rails and were discarded from the averages together with the exceptional sample, No. 21, the classification figures in Table III for the rails that gave good service would become practically identical with those for the rails rolled from reheated blooms, which offer a more striking comparison with the figures for the rails that failed.

Attention should also be drawn to the three samples, Nos. 28, 29 and 30, which were the only rails rolled by mill "E", and were received from a certain railroad where the service

may not have been as severe as that which some of the other rails endured. These rails were the worst of all in regard to sulphur prints, and also made a poor showing in regard to high-phosphorus streaks, although reported as having been rolled from reheated blooms. There is thus a suspicion that the mill practice was not the best where these rails were made, and that their service record might not have been so good had they been on the same lines as the other samples here considered. These rails were included among the averages in the "good service" and "reheated bloom" columns of Table III, but had they been omitted on account of being from a different mill and railroad from the other samples, the showing in these columns would have been better.

Summarizing the evidence connecting transverse fissures with the high-phosphorus streaks shown by etching longitudinal sections of the rails with a cupric-chloride reagent, it has been shown that in many instances the nucleus of the fissure is located in the most distinct of the streaks in the rail head, or in the uppermost of the distinct streaks, and that practically all rails that have been examined with this type of failure have been found to contain these streaks. Also it has been shown that of the rails examined, those rolled from reheated blooms were much less apt to contain these streaks, due to uneven phosphorus distribution, than the direct-rolled rails were, and many that gave good service in track, without failure, lacked the streaks entirely. This fact fits in very well with the discovery of Dr. P. H. Dudley, of the New York Central lines, that rails rolled from reheated blooms do not, with two exceptions to date, develop transverse fissures, and the natural inference is that it is because they do not contain the high-phosphorus streaks. This gives a definite reason both from practice and theory for reheating the blooms in rail manufacture.

It is not claimed that reheating the blooms is a sure cure and the only cure for transverse fissures in rails, because the presence of a fissure in sample No. 21 would refute this claim. But the evidence here given supports strongly the contention that segregation of phosphorus in abrupt alternate bands of almost microscopic size, running lengthwise in the rail head, is an important cause of transverse fissures, and that by reheating the blooms from which rails are rolled these bands may be reduced by diffusion and the tendency toward the formation of transverse fissures may be appreciably lessened.

These conclusions do not contradict or disprove the fatigue-failure theory of transverse fissures, although they seem to support the opposite view of origin from a defect in the steel.

Exporters Plan Increased Service

PRODUCERS who plan combinations under the Webb law may expect to meet with severe competition in their own endeavors right here at home. Export merchants are laying plans to beat them to the foreign markets and to carry with them the products of such American manufacturers as care to avail themselves of the sales and banking organizations built up by their houses.

The export merchants of New York especially are taking great interest in the development of their business and are preparing to offer to individual producers in the United States a service such as they were never able to command before. One large export merchant recently said that his house has in mind now the expansion of its services to such an extent that it will be able to relieve the American producer of all obligations and trouble in the marketing of his output abroad. This house plans to take the product of the manufacturer at the factory door, pack, ship, insure, pay the freight rate, market and collect the money on the sale, all without giving the producer the least thing to worry about.

Export merchants realize that this is the time they must justify their existence if they are not to be crowded out by the many export combinations of domestic producers which are reputed to be in the process of organization. They insist that they have the start on these export combinations inasmuch as they have already a world-wide organization which merely needs to be developed further and extended. On the other hand the new export combinations will be compelled to build up a new organization and establish their branches abroad.

Exporters Study Times

Since the signing of the armistice with Germany the export houses have been studying the trend of the times. They have sent numerous experts abroad to investigate business opportunities at first hand. Some of these experts are now about ready to return home and report. Many will remain in Europe until after the peace conference and keep their home offices posted of market conditions as they arise. Enormous demands for iron and steel products are anticipated, but the volume of these exports, it is said, may not expand very appreciably until outstanding orders are liquidated.

Exporters are today paying strict attention to the liquidation of business. This must be attended to while the world conditions are restoring themselves to normal, they say. The cancellation of some old outstanding orders from abroad is anticipated but these cancellations, it is insisted, will not be sufficient to affect world prices. South Americans are today causing the greatest trouble. Many orders booked from South America, before the war congestion became bad, have been cancelled, the purchasers believing that with the end of the war prices will go down. One big steel exporter declared he is convinced that the South Americans who have cancelled in anticipation of lower prices will discover they have made a mistake.

Shipping Delay Big Factor

It is not only a matter of prices which is giving the greatest worry to the South American purchasers, however, but the delay in shipping is causing apprehension. Large stocks of iron and steel products have been waiting in warehouses at all American ports because the ship space was not available for moving them. Within the past few months only 140,000 deadweight tons of shipping had been allocated to commercial uses, and this only because of the congestion of export business. Faced with an avalanche of threats to cancel orders, New York exporters sent a delegation to Washington last week to confer with officials of the food and fuel administrations, shipping board and war department.

This delegation placed the facts and figures before the government and obtained the promise that 350,000 deadweight tons of ships would be immediately allocated for commercial business. These ships are to be withdrawn from the overseas trade where they have been serving the American expeditionary forces abroad. The allocation, the war department threatened, would delay the return of the American troops home, but it was the consensus of opinion that it would be best to bring the troops back gradually than to permit American business to lose all the foreign markets.

This South American business is apparently the most important just for the moment in the eyes of New York exporting houses. They are all concerned lest the business associations obtained there during the war shall be lost and for this reason they are especially anxiously to liquidate at least the outstanding orders from these markets.

New York Protests Plan to Divert Freight

A protest against the plan which recently was approved by the federal authorities to divert ocean-going freight from New York to Philadelphia is being made by numerous organizations interested in the future of New York harbor. The New York-New Jersey port and harbor development commission has issued a statement to the effect that the congestion in the port of New York has been exaggerated. The congestion in New York harbor, according to reports compiled by the commission, is due entirely to war conditions and conditions will return to normal as soon as the government surrenders the piers it has commandeered. The commission points out that if the new federal ruling to divert trade from New York to Philadelphia is carried out, it would destroy at one blow the commercial supremacy which New York has held for years.

Experts Discuss Big Gun Erosion

Scientists Who Have Made a Deep Study of Erosion Suggest Means for Lengthening the Life of a Big Gun by Reducing Erosion to a Minimum —Rapid Progress Shown by Recent Naval Tests

AT THE recent meeting of the American Institute of Mining Engineers, Henry M. Howe, metallurgist, presented a paper on the erosion of guns. An abstract of this paper was published in THE IRON TRADE REVIEW for Feb. 7. The subject has a nation-wide interest at the present time and aroused considerable discussion. Among those who commented on the paper was Hudson Maxim, well-known authority on explosives and ordnance. Mr. Maxim commented in part as follows:

"As to the relining of guns; it costs $17,287 to reline a 14-inch gun, and takes about three weeks to dismount it, reline it and put it back, but they have a lot of spare guns always on hand, so that when a ship comes in and changes its guns, it does not necessarily have to wait for its own guns to be relined. Since the knowledge was obtained on which Professor Howe's paper was based, the navy department has made some important investigations and has made rapid progress in overcoming the problem of erosion. To what extent they have succeeded, I am not at liberty to describe, but I am permitted to say that they have already fired over 250 rounds from a 14-inch gun and it still fires accurately. A ship's guns can therefore fire twice as many rounds without serious erosion as the ship can carry.

"When this matter was taken up in the early stages of this investigation, we had an idea that the Germans had gone way ahead of us in the production of nonerosive steel for their guns, but we have found that if the Germans had won the war, it would not have been because they have better gun steel.

Powder an Important Factor

"One of the most important features of the problem is the powder charge in a gun. Last year I referred to the importance of the powder and mentioned the improvement made by the DuPont company in rifle powder. Also, that prior to the discovery of that peculiar rifle powder, a shoulder gun could be fired only from 3000 to 5000 rounds with the best powder before it was so badly eroded that the balls would tumble. The DuPonts have developed a powder with which a shoulder gun has been fired more than 20,000 rounds without losing its accuracy. The smokeless powder that has been developed by the navy is made of pure nitrocellulose, a modification of the nitrocellulose discovered by Mendeleeff. This nitrocellulose makes an excellent smokeless powder and is much less erosive than any of the powders used abroad in large guns.

"Many persons have an idea that when a gun is fired, the powder actually explodes in the sense that a high explosive explodes. It does not do anything of the sort. It merely burns like a piece of wood in the grate, only faster. The time that a projectile remains in a big gun after the powder charge is ignited is about 1-50 or 1-60 of a second. In that time the whole 380 pounds of smokeless powder in a 14-inch gun has to be consumed. It is necessary to have hot gases in order to give the projectile the required velocity. Suggestions have been made, and numerous experiments have been tried, to cool the gases in order to lessen the erosive effect on the bore of the gun. That will not do beyond a certain extent, and there is so much carbon monoxide produced and so little carbon dioxide in the combustion of our pure nitrocellulose smokeless powder that we have nearly reached the minimum of the coolness desirable in the gases. In one of the long navy 12-inch guns, the heat sacrificed by the gases in giving the projectile its muzzle energy of, say, 50,000 foot-tons, is equal to that required to melt something like 750 pounds of cast iron, so that the work in propelling the projectile from the gun is considerable, and it is the chief cooler of the gases.

"If the gases were perfectly cool, there would still be erosion, even if it were possible to use gases at the temperature of the atmosphere, for the reason that there is such terrific vortex action, the gases traveling at such high velocity and having such great density. A meteorite, when it strikes the outer atmosphere, gets hot enough to ignite and burn up in the oxygen of the air as it passes through it. Now the speed of a meteorite is not much greater than the speed of the gases in the vortex motion that occurs in the bore of a gun.

"The DuPont company acquired an invention of mine designed to burn progressively in the bore of a gun. There are two ways in which powder can be made to burn in a gun. The pure nitrocellulose colloid of which our smokeless powder is composed burns with such comparative slowness in a gun that, in order to employ a charge of sufficient mass to get the required velocity without prohibitive pressures, it is necessary that the powder be multiperforated so as to increase the initial surface presented to the flame of ignition, or nitroglycerin or some other oxidizing agent must be added to make it burn more rapidly. The simplest method is to multiperforate it."

J. S. Unger, Pittsburgh, in his written discussion of Mr. Howe's paper pointed out that while Mr. Howe dealt with the technical side of the question he would endeaver to present the subject from its practical side. Mr. Unger's discussion was as follows:

"A 14-inch gun costs about $60,000 and has to be relined after, say, 170 shots have been fired, its actual firing life thus having been 10 seconds. The cost of relining the gun once is about $18,000. During the war, or when the gun is in actual service, it must be in the shop for repairs approximately 40 per cent of the time. If the 14-inch gun fired 170 shots during the first seven months of a year, it would be in the shops for the following five months. When this is considered, the importance of the practical side of the problem must be evident. In order to have the tube of an unlined gun, or the liner of a lined gun, which are the parts affected by erosion, accepted by the purchaser, it must conform to these requirements:

(1.) The ingot must be made by approved methods.

(2.) The ingot must be of such size as to permit of a reduction in cross-section, during forging, of 4 to 1 when compared with the finished forging.

(3.) The forging must be annealed, then rough bored and turned, then heated and quenched in a cooling medium, followed by a final heating or tempering treatment at a lower temperature than the preceding treatments.

(4.) At each end of the treated forging four tangential specimens for tensile tests, 90 degrees apart, are taken, which must show the following qualities, for a 14-inch gun:

Elastic limit, lbs. per square inch....	46,000
Ultimate strength, lbs. per square inch	86,000
Elongation in 2 in., per cent.....	18
Reduction of area, per cent.....	30

(5.) The steel must be readily machined.

(6.) The finished gun must stand a proof or firing test, or be subjected to an internal gas pressure of about 35,000 pounds per square inch, without deformation.

"Other requirements could be given, but these are the principal ones. They indicate that a plain carbon steel of about 0.50 per cent carbon, or an alloy steel of about 0.40 per cent carbon are the only materials available at this time which will meet the preceding requirements.

Principal Causes of Erosion

"Erosion has been attributed to many causes, the principal ones being high perature, high pressure, mechanical abrasion by the projectile in the bore of the gun, rush of gas ahead of projectile, gas at high velocity behind the projectile, and the sandblast effect of the grains of powder.

"Without attempting to specify which cause is responsible, they may produce carburization of the metal, hardening and cracking of the surface, wearing or washing away of the metal, depositing

of copper, iron, or their oxides in the cracks, and the production of a different macroscopic and microscopic structure in the part affected. Many of these results have been known for a number of years, but this knowledge has been of little direct value in correcting the trouble.

"As pointed out by Professor Howe, we are interested in the solution of the problem from one side only, the use of a metal or alloy which is less erodible than steel. An examination of the results of actual experiments made with different metals shows results which at times are conflicting. We find that a Parson manganese bronze and a cast iron have given poor results when compared with steel under actual firing tests. Aluminum bronze in a small arm offered good resistance to erosion, but failed on account of lack of strength. Alloys used in tests of bombs were poorer than steel. Three steels of 0.30, 0.40 and 0.90 per cent carbon, when used as liners in a gun with modern powder chamber pressures, showed that the higher the carbon or the hardness, the greater the erosion. Three steels of about 0.22 per cent carbon, and as near the same chemical composition in other respects as it is possible to produce commercially, ranked first, fifth and tenth in their resistance to erosion in a firing test. Wrought iron and soft steels appear to offer good resistance to erosion in some tests, but such material will not meet the requirements of the present specifications.

Tests With Plugs

"Copper vents fastened in the body of a gun, which permitted the escape of gases only, gave good results, but not comparable with the effects produced in the bore of gun which resisted the gases and the mechanical abrasion. Plugs of various metals fastened in the orifice of bombs and subjected to heat and gas pressure were not satisfactory. Plugs inserted in the breech blocks of guns were in the same class. The erosion in the powder chamber of a gun is very small when compared with that at the origin of a rifling. The advantage of forging the steel seemed to give some promise, as the greater the work done in forging, the better the resistance, until it was shown that when a great deal of work was done, the steel became inferior in its resistance to erosion.

"Any substitute for a regular steel liner must not crush or burst during service. Bursting may be prevented by supporting the lining material by the tube and jacket. It must have sufficient longitudinal strength to prevent rupture, and consequent blowing out of the gun. This might be prevented by proper support of the surrounding parts. It must be readily machined. If a substitute metal or alloy be found, which gives better resistance to erosion than steel, its cost is determined by the extra life it has beyond that of steel. This would be largely modified, however, by the advantage of possessing, in a case of great emergency, a gun with a much longer firing life.

"Tungsten and molybdenum have been suggested as substitutes, but they are not easily machined, particularly tungsten, even when in the ductile condition. To prepare ductile tungsten in masses sufficiently large to be used for even a part of a liner would be almost impossible. Both metals oxidize easily at a red heat, and each absorbs carbon under proper conditions, becoming brittle. Their alloys with aluminum or copper, or with each other, may show better results than the metals alone.

Plug Test is Recommended

"Alloys of nickel and chromium are commercially produced, and could be obtained in sizes from which liners could be made. These alloys have properties, when subjected to high temperatures, which recommend them. A roll for a rolling mill is used under conditions of high temperature, pressure, and abrasion, resembling the conditions in firing a gun.

"Other common metals will suggest themselves. Plugs of several metals or alloys, and similar plugs of liner steel for comparison, could be screwed into prepared holes extending through that portion of the steel liner where the erosion is greatest. After firing, examination would show any real differences between the plugs, and such results should be confirmed by a liner made of the material showing the least erosion.

"It may be possible to deposit electrolytically a heavy shell of nickel, copper, bronze, brass or even iron on the inside of the tube, and then bore out and cut the rifling in this shell. My belief is that any pronounced relief will not be obtained by a study of the effects of erosion, but by actual trials of the more common metals as liners. These tests must be made in the bore of a gun, not in bombs, the breech block, or in the powder chamber."

Tests Prove Merit of Cast-Steel Chain

BY W. L. MERRILL

IN experimenting with cast chain the General Electric Co. assumed that wrought iron is a good material, and that it would find more favor in chain having some approximation to the qualities of wrought iron chain than in one whose physical characteristics are radically different from the commonly used material. Therefore, it set out to make a composition of cast steel which, while it was easily cast into the necessary forms and sizes, would be soft and ductile. Softer or milder steels can be cast, but not quite so readily as the 0.30 per cent carbon steel selected. The required degree of ductility in such a steel may be obtained by simple heat treatment. The result is a steel not especially high in strength, although far stronger than wrought iron, but which has sufficient elongation and reduction of area to indicate a good degree of ductility.

The average of the tests made on a great many heats would be about 35 per cent reduction and 21 per cent elongation. This metal is not radically different from wrought iron in its tensile properties, and the approach to the physical characteristics of wrought iron is the more satisfactory when one considers that refinements of grain in cast steel is the result of heat treatment. Chain made from such steel would be stronger than wrought-iron chain, that is, under either static load or impact a higher stress would be required to deform it, while when tested to destruction it would be deformed nearly as much as wrought iron chain when fracture finally occurred. The General Electric Co. felt it had offered a good answer to the problem, namely, a cast chain stronger than and equally as tough as the wrought chain universally used.

Conclusions Justified

The National Malleable Castings Co. saw the resemblance between the problems of cast steel anchor chain and car coupler knuckles and offered the materials for chain which they had found satisfactory for the knuckles. The physical properties of the Naco steel are not given in detail, but the results of tests indicate a material of great strength, whose elastic limit approaches the ultimate strength and which, while not actually brittle, does not possess a very high degree of ductility. Chain made from such material may only be deformed by greater stresses than are required to deform wrought iron chain. In fact, in some of the tests deformation of the Naco chain did not begin until the application of a stress which had caused a prohibitive degree of distortion of wrought iron links. Finally, the Naco chain failed with a small amount of deformation, sufficient to indicate that the material, though "short", is not completely brittle. The general conclusion that Naco chain fulfilled all of the requirements of a good anchor chain and was superior to welded wrought iron chain was fully justified.

Those having in hand the general question of a satisfactory substitute for wrought iron chain were offered two materials, both stronger than

---

Abstracted from a paper presented at the recent annual meeting of the American Society for Testing Materials, held at Atlantic City, N. J. The author, W. L. Merrill, is associated with the General Electric Co., Schenectady, N. Y.

wrought iron, but one of which, while considerably stronger than the other, was also much less ductile. Naturally the tests made to determine the fitness of either or both materials included shock tests, but difficulty was encountered in successfully carrying out shock tests from which valuable and definite conclusions may be drawn. The data from tests in the M. C. B. machine might apparently indicate that a chain which would resist a large number of blows when suspended vertically and show no appreciable distress, had inherently better shock resisting qualities than a more ductile chain which would, after a smaller number of similar blows, stretch and finally break. This may or may not be the proper conclusion Let us assume that we have two pieces of chain, one made from a steel in which the elastic limit and the ultimate strength are practically the same, and the second made from steel whose elastic limit is somewhat lower than the ultimate strength. In the case of the first chain, let us assume that the sample receives three blows of the tup from 20 feet and that no punishment is evidenced by the chain because each blow is not of sufficient force to stress the chain to its elastic limit but is just under this. In the case of the ductile chain under the same conditions, let us assume that the chain stretches ¼ inch for each blow, or ¾ inch for the three blows. It might appear from this test that the first chain was far better than the second. Let us assume, however, that the first sample receives one blow of the tup from 22 feet and that this blow will break the chain short. One blow from this same height on the ductile chain will simply stretch it a little in excess of ¼ inch.

Characteristics of Material

In other words, ductile material will stretch before it fails and "short" material will break short. These are the inherent characteristics of the material. Therefore, the conclusions drawn from results of the shock tests may be misleading. I wish in no way to give the impression that I believe the Naco chain is not superior to any anchor chain ever produced, but wish simply to bring out the fact that too broad conclusions must not be drawn from the shock tests.

The usual way for engineers to make use of stronger material is to lighten sections, thereby increasing fiber stresses while keeping them in safe proportion to the elastic limit, but when the form and dimensions are fixed, the use of stronger material increases the safety of the structure by increasing the elastic limit in proportion to the expected fiber stresses. It has shown that weight per unit of length, and hence cross-section, of an anchor chain is fixed for a vessel of given proportions. Therefore, advantage may not be taken of the increased strength of cast steel to decrease the size of the links as compared with wrought iron chain. Cast steel chain must be stronger than wrought iron chain, and the National Malleable Castings Co. steel is so much stronger than wrought iron that stresses sufficient to distort links made from the latter make no permanent impression on the National chain. In fact, no impact stress great enough to cause failure of the National chain will ever occur in service; hence the shortness of National steel is not a disadvantage in anchor chain, while its stiffness is a great gain.

Swedish Ore Output Grows

FIGURES obtained from the Swedish board of trade indicate that Sweden's output of prime iron ore decreased by 103,768 tons in 1916 as compared with 1915, while ore of other qualities increased in approximately the same ratio or 102,606 tons. Concentrates likewise increased 104,152 tons, so that the net increase in 1916 over 1915 production was 102,990 tons, with totals of 6,986,298 and 6,883,308 tons respectively. On the other hand, the exports of iron ore in 1916 decreased 5,536,641 tons from 5,992,215 in 1915. A slight increase over 1916 is noted for 1917, when 5,613,000 tons were exported.

The value of the iron ore output in 1916 was 69,306,204 kronor (a krona is equal to 0.268 cent American money) while in 1915 the output was worth 52,916,987 kronor. Including the briquettes produced from purple ore at the Halsingborg Copper Works, the entire output of iron ore briquettes in 1916 amounted to 388,358 tons, as compared with 411,902 tons in 1915.

Pig iron tonnage produced in 1916 decreased 3.7 per cent from 1915. The totals were 732,734 tons in 1916 and 760,701 tons in 1915, but the value increased from 70,877,179 kronor in 1915 to 114,677,680 kronor in 1916, which is equivalent to 156 kronor 51 ore per ton, as against 9 kronor 17 ore per ton in 1915. This diminution in pig iron production was due to the coke shortage as well as to the scarcity of charcoal during the latter part of the year. The output of electro pig iron increased from 35,075 tons to 44,782 tons of 27.7 per cent, due to the installation of a new electric blast furnace at Hagfors Iron Works.

Exports of iron in 1917 totaled 487,000 tons compared with 560,100 in 1916, a decrease of 73,100 tons, while imports decreased 198,700 tons to 100,400 tons in 1917 from 299,100 tons in 1916.

Ferrosilicon Tonnage Increases

A promising development is noted in connection with ferroalloys. The principal alloy is ferrosilicon of which in 1916, 18,452 tons were produced as compared with 11,819 tons in 1915. Blooms and muck bars remained the same in 1916 as in 1915, namely 119,000 tons, while the output of open-hearth steel increased 4.9 per cent from 503,766 tons in 1915 to 528,689 tons in 1916. Electric steel increased more than three-fold from 2187 to 6648 tons in 1916 with 17 furnaces in operation as against 10 in 1915. Bessemer steel dwindled from 91,070 tons to 76,031 or a decrease of 16.5 per cent.

An increased domestic consumption of wrought iron and steel by the engineering workshops is noted due to the cessation of cheaper iron imports caused by the war. This increased consumption of the more expensive Swedish iron brought a considerable rise in prices. The value as shown by the returns of the output from the iron works of hammered bar iron and steel, rolled iron and steel, and manufactures of iron, machinery, etc., aggregated 243,890,481 kronor in 1916 as compared with 144,413,326 kronor in 1915.

Importance of Magnesite

Magnesite is used almost exclusively by the steel industry in the United States. Magnesite is manufactured into a basic refractory brick essential for the lining of open-hearth furnaces. It is also used in the form of grain to make the open-hearth furnace bottoms. The consumption of this material in the United States is about 12,000 tons per month. Without this product the steel companies cannot successfully and economically produce the steel essential to winning our war.

Magnesite also makes a quick-setting cement and the Austrians and Germans are using their magnesite to make their gun emplacements and "pill boxes," as the material sets in about six hours. Previous to our war, practically all of the magnesite used by the steel companies was imported from Austria. After the beginning of the war and the stocks of magnesite in this country were exhausted, it became necessary to replace this Austrian magnesite with that produced in the United States. The known deposits of magnesite consisted of small veins in California, which, during the first year of the war, were worked and sold to the steel companies at high prices on account of the high cost of production. Since the war, the deposit of the Northwest Magnesite Co., Chewelah, Wash., was discovered, and developed at an expense of approximately $1,000,000.

Selecting Proper Size Mill Rolls

Relative Advantages Obtained by Using Rolls of Small or Large Diameter for Effecting a Given Reduction Are Outlined—How Cold-Working Alters the Physical Properties of Various Metals

BY F. JOHNSON

METAL rolling is said to have originated from the necessity for producing gold and silver coins from sheet metal of uniform thickness in order that the coins might be of equal weight. Brullier, a Frenchman, in 1553 obtained this uniformity by passing the metal between smooth rolls.

In the *Transactions of the Academie des Sciences* for 1728, is described a reversing rolling mill which was used for rolling lead into sheets. The rolls were 12 inches diameter and 5 feet long. The roller tables were provided to facilitate the feeding and return of the sheets to the rolls. Grooved rolls could be substituted for the plain ones and were used for rolling lead pipes from billets, placed over a mandrel.

Harbord states in the *Metallurgy of Steel* that rolling is carried out with one of two objects: First, to reduce the thickness and thus increase the superficial area of an ingot or bloom to form a plate or sheet. Second, to reduce both thickness and width, thus increasing the length, in order to form a bar of some desired cross-section. Thus the rolls do more rapidly and with greater accuracy, that which a smith performs, in hammering down a small plate or rod on the anvil.

Harbord shows that the action of a pair of rolls is analogous to that of a smith's sledge hammer with a sharply rounded face, which, when struck, allows the concentration of the force of the blow on a small portion of the bar. This facilitates and regulates the drawing out of the bar by stages, and is really a roughing-down process, the finishing being left to the "swaging" tools, which would require greater force and several heats if used from the beginning. The narrower the faces of the sledge hammers the deeper will they sink under a given pressure into the bar; the flat face of a sledge hammer would cause the metal to spread in all directions, while the narrow rounded face would cause an extension of the metal almost wholly in a direction at right angles to the axis of that face. Similarly rolls of small diameter sink more deeply than rolls of large diameter and cause less lateral spreading of the metal than the latter.

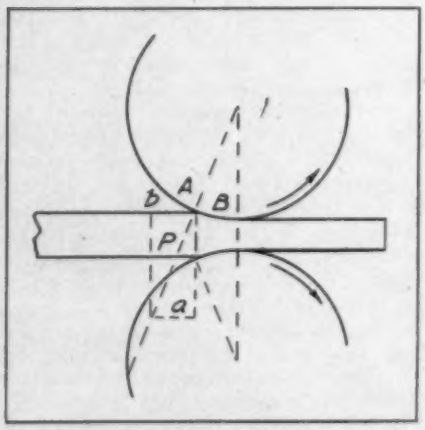


FIG. 1—RADIAL PRESSURE EXERTED ON METAL BAR

Comparison of Thin and Large Rolls

For a given number of blows with the hammer of equal force, the bar will be reduced in thickness to a greater extent when employing the narrow face than when employing the broad flat face. Similarly small rolls produce a thinner bar than large rolls for the same expenditure of power or effect the same reduction of thickness as large rolls with a smaller expenditure of power. By reducing the diameter of the rolls, we increase the horizontal component, in virtue of which the bar is lengthened and reduce the power which would have been expended in spreading the bar latterly. Thus, three advantages are obtained by using rolls of small diameter for effecting a given reduction in thickness. First, they reduce a plate more rapidly. Second, they cause less lateral spreading. Third, they consume less power.

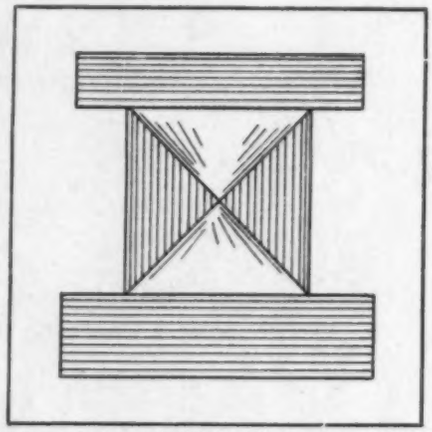


FIG. 2 — SIX PYRAMIDS WITH THEIR APICES MEETING IN CENTER RESULTS FROM A GRADUALLY APPLIED PRESSURE

Therefore, it will be advantageous to employ small diameter rolls when rolling hot metal of small thickness, owing to the rapidity of cooling. The smaller the diameter of the rolls, however, the greater their weakness and this consideration outweighs that of economy in power consumption.

There are simple relationships between the resistance to transverse stress of plain rolls and their diameter and length. The transverse strength of a roll is proportional to the cube of the diameter of the roll. It is also inversely proportional to the length of the roll.

Falk, in *Stahl and Eisen* 1910, volume 30, has shown that when a metal bar is fed between a pair of revolving rolls, a radial pressure (P) will be exerted on it. This pressure, as is shown in Fig. 1, resolves itself into two components, namely: The vertical component $A = P \cos X$ and the horizontal component $B = P \sin X$.

The vertical component represents the friction between the roll and the metal bar and the reduction of area; and, the horizontal component represents the resistance of the bar being gripped. So long as this is less than the friction resulting from A the bar will be gripped by the rolls and reduced in sectional area or broken if brittle. The two components A and B are functions of the angle X. If $X = O$, $B = O$ and thus the thickness of the bar does not exceed the distance between the rolls and it will easily pass through. If we take a thicker bar, the angle X is increased, as will also happen if we present the original bar to a pair of rolls of smaller diameter placed closer together. In both cases, the horizontal component B increases. But the arc AB increases the greater the diameter of the roll and thus, owing to the increase in friction between roll and bar (friction being proportional to surface of contact) the drawing-in power of the rolls is increased.

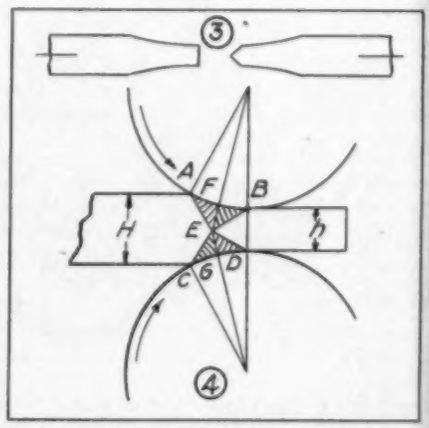


FIG. 3—PRESSURE CONES ARE FORMED WHEN METAL IS PASSED BETWEEN ROLLS. FIG. 4—HOW THE LENGTHENING OF A BAR TAKES PLACE

Thus, the thinner the bar, or the greater the diameter of the rolls, the more readily will the bar be gripped. In practice, if the angle X be more than 30 degrees, or, in other words, if the thickness of the bar exceed one-tenth the diameter of the roll on entering and less than one-twentieth on

From a paper presented at a meeting of the Birmingham Metallurgical society, Birmingham, England.

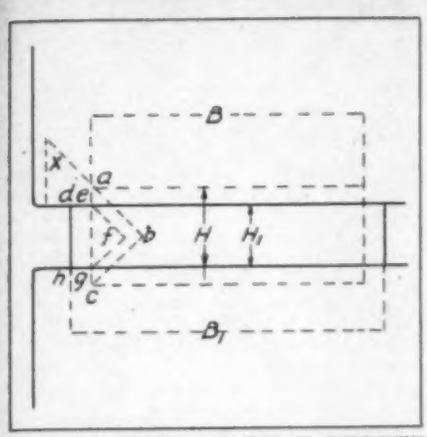


FIG. 5—LENGTHENING OF BAR IS DEPENDENT UPON ITS THICKNESS BEFORE AND AFTER A PASS AND IS INDEPENDENT OF ITS WIDTH

leaving, the bar will not be gripped. Harbord states that roughing rolls under favorable conditions will grip the ingot without much roughing if the angle *X* is within 30 degrees. It is found also that with rolls whose centers are fixed, the thickness of the piece which the rolls can satisfactorily take, does not exceed one-half the distance between roll-centers. In a box pass this will effect a reduction of area of 13 per cent in the first pass, as is stated by Harbord.

Size of Rolls Required

To obtain a reduction of 25 per cent in the first pass, rolls having a diameter at least one-fourth greater must be employed. The roughing of rolls, which process enables them to bite thicker pieces, is effected by cutting a series of indentations with a round-nosed chisel, thus forming on the surfaces of the rolls a series of small teeth which dig into and so firmly grip the piece of steel to be rolled that they drag it bodily into the groove. Such roughing is inadmissible in the finishing passes, as the surface of the bar would be spoiled.

Large rolls possess advantages other than the strength. The pressure due to rolling is distributed on surfaces which are large in proportion to the increase in size of rolls, so that the pressure per unit of surface is less than with small rolls resulting in less wear and tear. This means less frequent stoppages for repair and replacement and is an economy which may more than counterbalance the increase in power consumption. Moreover, although the abstraction of heat from the metal during hot-rolling by large rolls is greater than by small rolls, this may be compensated by increasing the speed. Metal passing through the rolls at the increased speed would lose less heat by radiation to the air for a given reduction than at the lower speed.

With the larger rolls, there would be also an increase in the heat-radiating power which would allow a proportionate increase in the number of passes per hour. The larger rolls, too, would maintain a more uniform temperature but would consume more power.

By continually rolling a flat bar in one direction, its length in that direction is increased and the rate of travel of the reduced section will always be greater than the section entering the rolls. The increase in width will be comparatively small, so that resort must be had to cross-rolling in order to widen as well as lengthen. The widening of a piece of steel at right angles to the direction in which it is being lengthened is remarkably small and is dependent more on thickness than on length. It is, in fact, independent of length and of width.

Rolling Process Defined

The squeezing of a piece of metal under the hammer or between rolls is accompanied by phenomena which are far from being completely understood. The mere pressing or dropping of a ball onto a metal surface involves changes in the structure of that metal which are most complex and as yet ill-defined. When a cube of a brittle material is subjected to gradually applied pressure, fracture will take place along certain planes which leave six pyramids with their apices meeting in the center of the cube, as shown in Fig. 2. Although not easy to produce this result in practice, there is much evidence to indicate the correctness of this hypothesis. A cylinder of brittle material under pressure would similarly develop two cones, with their apices meeting in the center of the cylinder while the surrounding material would flake off.

These cones are called pressure-cones and are produced even in plastic material such as metal, but instead of flaking off, the material outside the cones will be plastically deformed and "flow" outward from the apices to the bases of the cones or pyramids if the metal piece is square or rectangular. This phenomenon is also observed when metal is subjected to tensile stress. The fracture of a homogeneous metal test-piece shows a distinct cone on one half and a cup on the other.

As shown in Fig. 3, there was really a double cone formation but the metal which has been torn away from one cone has adhered to the other. When pressure is applied to metal by a pair of rolls, pressure cones are formed in a similar way, the axes of the cones coinciding with the lines of pressure and the apices of the cones meeting where the lines of pressure meet. The metal surrounding the cones flows away longitudinally and to a small extent laterally. In Fig. 4 it is pointed out by Sheld how the lengthening of a bar or sheet takes place.

From thickness *H* to thickness *h*, pressure cones *ABE* and *CDE* are formed by the radial pressure of the rolls, the arcs *AB* and *CD* forming the

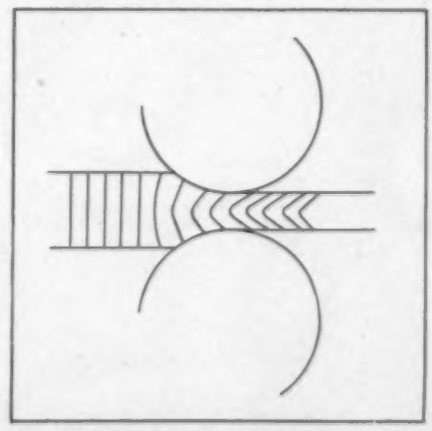


FIG. 6—UPPER CURVE REPRESENTS THE PROGRESSIVE REDUCTION FOR EACH PASS

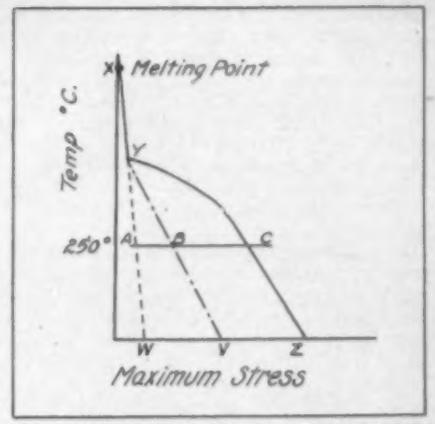


FIG. 7—DIFFERENTIAL FLOW OF METAL WHEN ROLLED

bases of the cones, which arcs represent the effective areas of applied pressure.

In moving through these arcs the rolls effect the reduction of the section *BFEGD* to the thickness of section *h*. Now it is clear that a rectangle of thickness *h* and length *FB* where the metal leaves the rolls at *BD* is smaller than the section *BFEGD*. Hence the latter will produce a rectangle of greater length than the arc *FB*, that is the length of the rolled portion produced by the movement of the rolls through arc *FB*, is greater than that arc itself. So that a bar or plate leaves the rolls at a much faster rate than it enters them, the greater the reduction the greater the difference in these velocities. This difference, as has already been mentioned, is greater in the case of small diameter rolls than in the case of large diameter rolls.

In Fig. 5 the rectangle *degh*, representing the increase in width, is equal to the triangle *abc* minus the triangle *cfg;* hence the increase in width.

$$de = \frac{abc - efg}{H_1}$$

This proves that the flattening of a bar is dependent only upon its thickness before and after a pass, and is independent of its width. If the amount of flattening of a bar has been found experimentally, the pressure-cone angle *X* can be calculated, or, given the angle, the width can be determined. Shell states that practical experiment shows a bar spreads laterally the lower its temperature; hence the pressure-angle must increase with the temperature.

When rolling a plate between smooth rolls or a rod in an open pass, the edges become uneven and ragged and have to be trimmed later. If, in a closed pass there is not sufficient room to allow for the flattening out of the metal, considerable lateral pressure will be exerted by it on the flange unless special precautions are taken to round off the form of the groove.

Reduction of Sectional Area

There will always be a tendency in the rolling mill to put as severe a "pinch" on the metal as possible without tearing the metal. The greater the reduction of area at a single pass the greater will be the output and the greater the economy in fuel, time and labor involved by annealing or reheating and labor due to a smaller total number of passes. In hot rolling there will always be to some extent a saving in power

because less heat will be lost by the metal the fewer the passes and consequently the metal will be softer.

The amount of reduction allowable per pass varies with the resistance offered by the metal, the temperature of the metal and rolls, the power of the rolls and the ratio of size of rolls to size of metal bar or plate.

Pure copper will allow a greater reduction per pass than Muntz metal at all temperatures and, as in practice, copper is rolled at a much higher temperature its reduction in thickness can be more economically effected. The same applies to wrought iron or mild steel as compared with high-carbon steel.

Assuming that all the four conditions previously mentioned are subject to no variation, it will be found more economical in power to bring about a given reduction in thickness by arranging for a uniform distribution of reduction over the total number of passes.

If S represents the section of the original piece $S_1 = x^1S$ the section after the first pass; $S_2 = x^2S$ after the second pass; $Sn = x^nS = R$ after the No pass, then $X = n \vee \frac{R}{S}$ = the reduction factor.

Angstrom in *Oest Jahrb*, 1891, volume 39, gave an example of a plate 120 millimeters thick which was to be reduced to 6 millimeters thick in 18 passes with a constant reduction factor, then

$$X = 18 \vee \frac{6}{120} - 0.84668.$$

The upper curve in Fig. 6 represents the progressive reduction for each pass, using this factor. Thus $120 \times 0.84668 = 101.6$ millimeters which is the thickness to which the plate is reduced in the first pass, 101.6 millimeters $\times$ 0.84668 = 86 millimeters the thickness after the second pass, and so on.

Cold Working Alters Conditions

The cold working of metals brings about profound changes in the physical properties. The following properties show an increase in value, viz.: Elastic limit, yield point, tensile strength, resistance to hardness, electrical resistivity, solubility in chemical solvents, and in the case of iron, magnetic hysterisis. Cold-worked metal is electro-positive to the same metal in the annealed state. The properties which show a decrease in value are specific gravity, percentage elongation, percentage reduction of area, resistance to impact and bending stresses, and, in the case of iron, magnetic permeability.

Rolling differs from hammering or stamping in that the pressure is slowly applied and is released when the metal has yielded, instead of being applied rapidly and released before the metal has fully yielded. In cold-rolling, there must be in addition to the permanent yielding or deformation, a slight amount of elastic deformation, consequently the thickness of a bar should be slightly greater after passing through the rolls than the distance between the rolls. The action of the rolls is to increase the elastic limit.

In 1883, Hollenberg showed the differential flow of metal when rolled. By inserting wires vertically into holes bored into a bar, rolling the bar and then planing it down, he found that in cold-rolling, the curvature of the wires along the surface of the bar was greater, but in hot rolling was greater along the center. This is shown in Fig. 7. A bar having the inside hotter than the outside will show convex ends after rolling and concave ends when the outside is hotter.

The author has found that a piece of severely hard-rolled bronze 0.31-inch thick leaves the rolls having a thickness approximately 0.01-inch greater than the distance between the rolls. This was proved by annealing the piece in a closed container to prevent oxidation and then rerolling. The rolls had been left untouched while annealing was in progress. How much of this difference between thickness of rolled metal and distance between rolls was due to elastic compression of the metal and how much to temporary widening of the space between rolls during rolling, was not determined.

Rate of Reduction

The rolling of metal is a shaping operation and involves the application of mechanical pressure exceeding the elastic limit of the metal to be shaped. The greater the malleability or the greater the difference between elastic limit and ultimate stress of the metal, the greater the amount of reduction in area which it will stand without splitting. Both elastic limit and tensile strength are in general lowered by a rise in temperature, so that, unless a constituent which is fusible or brittle at the elevated temperature be present, the metal can be rolled with a smaller expenditure of power. The elastic limit may be lowered to a greater extent than the tensile strength for a given rise of temperature, in which case a wider working range is obtained. Some metals such as zinc have only a small working range of temperature. Hot-working brasses, too, owing to the existence of a critical point at which a crystalline change occurs (about 460 degrees Cent.) and at which they become distinctly brittle, have a smaller working range than pure copper. The variations of elastic limit and tensile strength due to variations in temperature are not always regular.

So long as no appreciable fall in temperature occurs during hot-rolling there is no appreciable increase of elastic limit due to mechanical work, and therefore increased resistance offered by the hot metal to deformation can only be due to an increase in elastic limit due to falling temperature.

It is possible to permanently injure metal by overstrain in rolling. Rolf in *Stahl and Eisen*, quotes an open-hearth mild steel of the following composition:

	Per cent
Carbon	0.07
Phosphorus	0.02
Manganese	0.40
Sulphur	0.05
Copper	0.15
Silicon	0.04

This was of specially good quality, but by cold rolling excessively, the material gave only 18 per cent elongation in the well-annealed condition as compared with 29 to 32 per cent elongation when in the originally annealed condition. This would indicate that incipient disintegration had taken place along surfaces of internal slip, but not to an extent sufficient to completely ruin the metal. The chief difference observable between the microstructure of metal which has been hot-rolled and that of metal which has been cold-rolled is in the shape of the crystal-grains. In hot-rolled metal, that is metal which has been finished above the recrystallization temperature, there is an aggregate of equi-axed crystals, owing to the fact that recrystallization has kept pace with the rate of cooling, while in cold-worked metal (worked below the recrystallization temperature) the grains are distorted and are often elongated in a direction parallel to the direction of elongation of the metal by the rolls.

In commercial rolling, metal which has been hot-rolled is frequently finished below the critical temperature of recrystallization and in such a case is susceptible of softening by annealing.

New Alloy for Cutting Tools

An alloy for use in cutting tools which is said to have efficient cutting properties has been patented by Hugh S. Cooper, Cleveland. The alloy comprises nickel or cobalt, zirconium, aluminum and silicon, or their equivalents, together with one or more metals of the chromium group, for example, tungsten, molybdenum, chromium or uranium. According to the inventor, the introduction of one or more of the metals of the chromium group improves the cutting efficiency of the alloy.

In producing this material, the desired portion of nickel oxide black and Brazilian zirkite, carrying a minimum of approximately 90 per cent zirconium oxide and about 15 per cent silica, is ground to 200 mesh, sifted, dried and thoroughly blended with the desired amount of 200-mesh aluminum.

This mixture is next transferred to a crucible, which is lined with magnesia or alumina, and lighted with magnesium ribbon. After the reaction, when the slag has solidified, the metal is tapped and transferred to a standardizing furnace and the desired amount of metal of the chromium group is then dissolved in the molten alloy.

After standardization, the alloy is poured into molds made of carbon. The inventor states that the more desirable alloys comprise 1 to 10 per cent silicon, 1 to 12 per cent aluminum, 1 to 20 per cent zirconium, 1 to 25 per cent tungsten and the remainder nickel or cobalt.

To cut down manufacturing costs, the inventor states that it is desirable to make a composition showing a scleroscopic hardness of 80 or 90, but a composition of this hardness, it is said, does not possess sufficient strength to be most efficient for cutting tools. It is said that an alloy showing a hardness of 58 to 65 will cut almost any metal encountered in ordinary shop practice. For this reason, more nickel is added to a given composition which is harder than 58 to 65, thus increasing the strength and toughness of the composition.

Room for Development

In response to the question: To What Extent and Where Will the Gas Producer be Used to Produce Maximum Economics? In the symposium of the American Society of Mechanical Engineers at its spring meeting at Wor-

cester, Mass., June 4-7, 1918, Robert H. Fernald, professor of dynamical engineering, University of Pennsylvania, Philadelphia, offer the following discussion:

There seem to be three obvious fields for producer gas development:

1. For extensive power production at the mines.
2. As a substitute for natural gas for general heating purposes.
3. In conjunction with by-product coke ovens.

In the field of power production through the internal-combustion engine the application of the gas producer seems limited to plants of relatively small capacity. This is due to the fact that the practical size limit for gas engines seems to be not over 5000 horsepower and few engines of this size are built. The gas-engine-gas-producer combination can hardly be considered for central station service. For large power installations the natural development is the by-product producer-gas plant located at the mines in conjunction with steam boilers and steam turbines. The low efficiencies due to the two-step conversion—first, gas generation from the coal and, second, burning of the gas under steam boilers—may be counter-balanced by the development of highly efficient boilers equipped for gas burning, and by the return from the valuable by-products secured from the coal. Should the development of the gas turbine result in commercial units that compare favorably with the present large steam turbine units, additional marked economies may of course be looked for.

The third field embraces two divisions, one in which there is an unlimited demand for the coke from the ovens as well as for the gas and by-products and one in which there is no market for the coke but a ready market for the gas and by-products.

The type of plant in the first case is composed essentially of two distinct installations, a by-product coke plant and a by-product producer-gas plant. The entire gas output of the coke plant may thus be made available for the market, as the lower heat value producer gas may be used for heating the coke ovens. One of the advantages of this system lies in the fact that coke breeze and low-grade fuels may be used in the producers. In a large European plant of this type the coke-oven gas is the main product and the coke, which finds a ready market, is regarded as one of the by-products. The by-products from the producer-gas plant, sulphate of ammonia and pitch, practically pay the cost of operation of this portion of the installation.

New Record in Furnace Flux Production

THE production of limestone used for flux in the United States in 1917 surpassed the record production of 1916, showing an increase of 1,743,920 long tons, or 7 per cent, in quantity and of $4,561,103 in value, according to statistics just issued by the United States geological survey. These increases followed increases of 24 per cent in quantity and 44 per cent in value in 1916, and of 24 per cent in quantity and 23 per cent in value in 1915. The average price in 1917 was 73 cents a long ton, compared with 59 cents in 1916 and 51 cents in 1915. Production in 1916 was reported from 33 states; in 1917 from 34 states, Nevada reporting production for the first time. In 1917, as in 1916, five states produced more than 1,000,000 long tons, Alabama rising above that figure and Illinois falling below. Five states exceded $1,000,000 in 1917, whereas only three exceeded that value in 1916. Of the 22 states shown in the accompanying table, nine showed decrease in quantity but only three showed decrease in value. The nine states whose quantity decreased included Pennsylvania and New York in the East, Wisconsin, Illinois and Kentucky in the central region, and Colorado, Montana, Utah and California in the West. Pennsylvania fell below the 10,000,000-ton mark, which it passed in 1916, but its output was still more than double that of the second state, Ohio, and nearly three times that of the third state, Michigan. The combined increase in quantity for Ohio and Michigan was nearly four times the combined decrease of Pennsylvania and New York. New York's output had also decreased in 1916. The three central states, Wisconsin, Illinois and Kentucky, though showing a decrease in production in 1917 were still far ahead of 1915. Only a small part of their decrease in 1917 was offset by gains in adjacent states, but their total loss was less than 10 per cent of the gains of Ohio and Michigan, which can supply the same markets in the Great Lakes region. The combined decrease of the four western states mentioned was nearly double the gain made by other western states, and the loss of Montana alone, 208,910 long tons, was more than 50 per cent greater than this gain.

The states showing the most striking increase were Ohio, New Jersey and Maryland in the East, Tennessee and Alabama in the South, Michigan and Indiana in the central region, and Arizona and Washington in the West. Maryland, whose output rose from less than 5000 long tons in 1915 to more than 146,000 long tons in 1916, made a further gain of 22,256 long tons in 1917 and its value passed the $100,000 mark. West Virginia, which passed the 1,000,000-ton mark in 1916 made a further gain of 299,194 long tons in 1917 and the value of its output passed well beyond $1,000,000. Alabama produced more than 1,000,000 long tons and the value of its product exceeded $1,000,000 for the first time. Michigan gained 541,932 long tons in 1917, continuing her steady increase in output since 1913, the year in which this industry was begun in the state. Arizona and Washington more than doubled the quantity and value of their output in 1917, due partly to the fact that the deposits are easily worked.

Furnace Flux Sold in the United States in 1916 and 1917

	—1916—		—1917—	
	Quantity, long tons	Value	Quantity, long tons	Value
Alabama	867,785	$807,344	1,125,838	$1,116,647
Arizona	68,069	41,426	153,777	111,328
Arkansas	*	*	*	*
California	79,607	86,921	59,801	78,414
Colorado	564,147	332,187	549,852	387,184
Connecticut	*	*	*	*
Georgia	*	*	*	*
Idaho	*	*	*	*
Illinois	1,120,175	427,058	991,879	434,447
Indiana	282,748	132,145	322,286	158,476
Iowa	4,398	3,407	13,206	13,895
Kansas	*	*	*	*
Kentucky	69,447	41,807	56,016	44,826
Maryland	146,276	79,565	168,532	107,156
Michigan	3,033,155	1,207,326	3,575,087	1,633,965
Missouri	61,500	49,227	64,262	72,542
Montana	633,729	206,153	424,819	183,538
Nebraska	*	*	*	*
Nevada	.....	.....	*	*
New Jersey	289,043	178,266	368,850	327,226
New York	657,788	$405,774	582,359	$430,258
North Carolina	*	*	*	*
Ohio	3,281,324	1,636,991	4,428,903	2,521,714
Oregon	*	*	*	*
Pennsylvania	10,019,046	6,768,374	9,646,902	8,639,233
Rhode Island	*	*	*	*
Tennessee	113,149	65,352	152,597	110,290
Texas	60,424	44,947	*	*
Utah	292,681	167,888	278,803	170,332
Vermont	*	*	*	*
Virginia	361,598	189,339	375,469	290,942
Washington	17,582	14,813	42,277	43,126
West Virginia	1,451,700	966,031	1,750,894	1,439,843
Wisconsin	131,566	77,988	105,379	80,667
Undistributed	16,571	16,553	129,640	111,936
	23,623,508	$13,946,882	25,367,428	$18,507,985
Average price	.....	$0.59	.....	$0.73
Percent of increase	.....	.....	7	33

*Included in "undistributed".

Machine Tool's Future is in Export

American Equipment Industry Increased 100 Per Cent in Wartime—Must Find Outlet in Foreign Markets—Government Should Co-operate in Every Way Possible With Reference to Prices, Etc.

BY J. N. HOOK

MAGNIFICENT efforts were expended by the machine tool manufacturers of this country toward winning the war. Unstinted sacrifices were made by them on every hand to bring about a marvelous production of machinery. That machinery played a large part in the construction of the engines of war. In fact, no single group of men in America, outside of the fighting men themselves, did more to set the tribes of Berlin clamoring for terms of "unconditional surrender" than the great, loyal body of American machine toolbuilders.

While revelling in victory however, the thoughts of the trying days ahead must certainly claim consideration. Never in the history of the industry, perhaps, have more difficult problems required solution.

It has been stated that the increase in the manufacturing capacity of America's machine tool industry, due to the war demands, amounts to about 100 per cent of its prewar size. This increase is represented in the enlargement of old established shops and also in the creation of entirely new industries which are ready to claim their share of the business. Now that the war is over and the demand from that source eliminated, the necessity for exploiting the foreign machine tool markets is greater than it ever has been.

The industry in the past four years has doubled in size. Domestic markets are capable of absorbing only one-half of its output; an enormous surplus of machines is in the hands of our latest customer, the United States government and must be disposed of; hence foreign disposition is necessary.

Next Year Holds Problems

It doubtless is patent to all that the year ahead holds prospects of many serious problems. To get at the most serious one, suppose we analyze, briefly, the steps that have led up to it.

When the war began, Germany, Austria and Belgium immediately were eliminated from the machine tool world. All belligerents were forced to turn all of their manufacturing capacity to the production of war supplies. This meant that the demand for machine tools in France, England, Italy and Russia had to be supplied by America. Germany and Austria, shut off from the outside world, had to produce their own. This resulted in a tremendous increase to the American machine tool industry. Its export market quickly assumed enormous proportions.

Next came America's entrance into the war which resulted in the munitions industries of France, England and Italy stopping expansion and leaving America to build a war machine greater than any that had yet been produced. This turned the tide from export to domestic business again and left the great shops of our allies practically fully equipped with American machines which were rapidly wearing out.

War Work Takes Capacity

So great was America's war effort that practically the whole machine tool capacity of the nation was absorbed by it alone. Great government shops, equipped with millions of dollars' worth of machine tools, were built here and in France. Hardly had these shops started to operate when the war ended leaving all of this vast quantity of machinery, much of it unused, on the government's hands. In addition machine tool factories all over America have millions of dollars' worth of machines in process of manufacture.

Now the question of the hour is what will become of this great surplus? Manifestly, it would be most dangerous to the industry as a whole if the government, after dismantling these plants, should offer this machinery, as is the usual custom, to the highest bidder.

Because of the great volume of tools some manufacturers have supplied it would work a great hardship on them to buy all of it back. On the other hand, if the government sells this material promiscuously, a great quantity of it will go into the hands of house-wrecking companies and curbstone traders who only are interested in buying it cheaply in the first place and selling it at any profit-yielding price.

Can the machine tool industry afford to have this thing happen? I think not, and I sincerely hope that the machine tool builders will take definite action looking toward a safe and sane method of disposing of all this machinery. Personally, I should like to see the government make each manufacturer the special disposition agent of his own line for government account.

Labor also must be considered. I believe that the government would welcome some well-defined plan to keep the machine tool industry going at a reasonable speed in order that the army of labor which it commands can be kept employed.

Until this matter is definitely settled the entire industry will be on a basis of uncertainty. Machinery users all over the world are expecting a drop in prices and are slowing down on purchases. Dealers not knowing what machines will be thrown on the market any day, naturally are not ready to buy stocks without being protected by the manufacturer on the matter of prices. Once the policy of the government is fixed and provided it is a policy that will protect the manufacturer, I feel confident that buying will be resumed. A belief shared by many who have observed conditions abroad, is that we need have little fear of any surplus of machinery held by nations other than our own.

Then too the danger exists of the great producing element of our nation falling heir to the economic fallacy that it is wise to sell tools to any purchaser whether he really needs them or not. Nothing returns a benefit to its producer which is not consumed.

A manufacturer, who has been building machines wholly for war work, would be very near-sighted if he attempted to keep his shop going at top speed by insisting upon people buying more of his machines than the market could consume. In some instances, manufacturers have urged that we buy large stocks of their machines on the theory that their shops require business. This manifestly is uneconomic.

First, we could not hope to buy a sufficient quantity of machines to maintain their present possible speed of manufacture more than a month or two. Suppose we did keep their shops going full blast that length of time. Warehouses would be filled with machines built at war costs and the manufacturer would then of necessity line up with the demand of the times. Such a course of procedure would simply prolong the agony. The only thing to do at present is to realize that we are on an entirely new basis and that the great underlying source of our past enormous demand disappeared entirely with the coming of peace. We have to SELL tools now, not simply take orders for them.

Optimistic Concerning Future

I am not at all pessimistic over the future of the machine tool industry. The great privately-owned shops of the world are greater today than ever before. Their machinery is badly worn. Railroads in every country are needing equipment of every kind. The shelves of the world were never so barren. Thousands of shops of Belgium and northern France must be rebuilt; the coal and iron mines of France must be restored; the textile mills of Belgium must be re-equipped; sugar mills all over the world must be repaired; new roads must be made, and not an item of machinery required for these industries can be constructed without the aid of machine tools.

What we need is a definite governmental policy looking toward a protection of machine tool prices, augmented, of course, by a great selling

---

Extracted from a paper read before the seventeenth annual convention of the National Machine Tool Bui'ders' association, at New York. The author is vice president of the Allied Machinery Co. of America, New York.

organization of the machine tool industry itself. With these assured it will not be a year before the machine tool industry of America will enter again on a prosperous era.

Many Factors in Export Trade

The basic laws of all exporting, when conditions approaching normal arrive again, will apply to machine tools as well as to any other product. That America can compete in its manufactured products with Europe seems to be certain. We have a distinct advantage in our method of manufacture over other countries. On account of her great domestic market, America has been able to develop manufacturing specialists. For instance, the manufacturer of milling machines in this country can develop a large and lucrative business in that line alone. The same is not true of other countries with restricted local markets. Seldom do we find a French or English manufacturer there making but one line of goods. Mass production of specialties decreases labor costs and improves manufacturing methods. It also makes for a higher excellency of product and more rapid development and improvement in the machines themselves.

Another thing which the war taught America is the necessity of selling abroad from stocks on the ground. We cannot expect to compete without them.

Extension of credit is another important factor. While we used to demand cash for our goods, we must in the future grant longer terms of credit. Thanks to the growing organizations of some of our biggest American banks, this will be convenient and possible.

Extremely important, too, is the necessity for crating our export shipments in the smallest possible space and in the most substantial manner. Hundreds of reports from all parts of the world, giving exporting rules to the main point of caution is the matter of boxing. The government, too, in its great over-seas shipments during the war, was so impressed with the necessity of proper boxing and crating that it issued a bulletin on the subject.

Allied with this, of course, is the matter of packing lists, containing necessary information to enable the foreign customer to get goods through customs without delay and at the lowest possible cost. In a great measure, American shippers have learned many tricks of exporting during the war.

The matter of exchange is also important from the standpoint of export business. If the United States' dollar is worth in excess of its normal value at any particular time, it means that your goods will cost your customer more in his own currency in proportion. This often puts the manufacturer at a disadvantage and, unless his agent has some means to dispose of the native currency which is paid, other than by converting it immediately into dollars, then native manufacturers can greatly undersell.

This problem, of course, will be materially simplified when America begins to buy great quantities of foreign merchandise for delivery to all markets of the world. It will enable us virtually to trade in commodities, using exchange merely as a convenient expression of value. This will be possible when our merchant marine is plying all waters of the globe. Exchange in many countries, at the present time, is very much in favor of the dollar which means an increased cost in native currency for your goods. This exchange disadvantage, together with the disadvantage of extra freight, insurance, customs duties, etc., naturally mean that the lowest possible cost of production must be obtained by the manufacturer. He will have to do everything in his power to reduce the cost of his machine.

English and German Methods Compared

If we will study the methods employed by the two greatest merchant nations of the world before the war, England and Germany, we will find that the former built up her great foreign business through: First, merchant shipping and, second, investment of money in foreign countries in industries that formed permanent markets for her merchandise. Germany obtained her foreign business through: First, merchant shipping and, second, salesmen combing every market of the world. Germany did not spend much money abroad which only proves her former imperialistic aims which demanded that she keep her money at home.

America, due to her growing merchant marine, and also the fact that she now is the greatest creditor nation in the world, is in position to combine the two methods above described. She will have to furnish means to rebuild the devastated regions of Europe. Her credit will be sought in South America and the Orient. Her growing merchandizing firms even now, are engaged in the task of extending their selling organizations to all markets of the world. Her ships are rapidly growing in number and (provided our seamen's laws are amended to match with those of other countries) will soon be entering all ports of the world.

Aspect Improved by War

How different is the foreign trade aspect today as compared with four years ago: Then, strange as it may seem, the bulk of America's exports was controlled by foreigners. Several of the European countries, recognizing America's provinciality in the matter of the sale of her products, came to America and formed export houses of their own to sell American goods abroad. One certain house did an annual import and export business with South America totalling as much as $30,000,000 annually. Others obtained the exclusive selling rights of American manufacturers in the most important foreign fields.

When the war was started, many manufacturers in this country found their sales organizations in many of the best foreign markets completely destroyed. Then it dawned upon this country how dependent it was upon foreign export houses and sales agents for its export trade. The situation might have proved disastrous for much of our export trade, had not the war assumed such gigantic proportions that the manufacturing capacity of the entire world was taxed. The great demand for practically everything (machinery especially) afforded our manufacturers an opportunity to make new selling connections. The great expansion of the manufacturing capacity, which followed, has been fully equalled in the other belligerent countries. In them protective measures of all kinds will be established to give their industries every possible advantage. This is necessary in order that the exports of those nations can transcend their imports sufficiently to assist them materially in paying off their great foreign debt.

We cannot expect the free markets in those countries that we enjoyed before the war. Those nations, as a unit, are going to encourage their own manufacturers in every possible way.

Must Secure Foreign Market for 100 Per Cent Surplus

OUR particular interest at this time may well be centered around the amount of business that we can obtain from foreign markets. We are fairly well posted on the market that exists at home and know about what it will absorb. With a knowledge of our production capacity, we have a clear idea of the surplus that is available for foreign consumption.

Our exports of machine tools reached a volume in 1913 *of* $16,097,315, *of which 70 per cent represented exports to Europe. The total manufacturing capacity of machine tools at the beginning of the war was approximately* $100,000,000 *per year. During the four years of war, these exports increased until, in* 1917, *they struck the enormous volume of* $84,935,410. *This great increase was partially due to an increase of about* 50 *per cent in prices. On the basis of prewar prices, this volume would be reduced approximately to* $56,000,000 *or an amount about three and one-half times the exports during the years immediately preceding the war.*

When the armistice with Germany was signed, the total producing capacity of the American machine tool industry, as near as we can estimate it, was about $400,000,000 *per year. Reduced to prewar costs, this would total about* $250,000,000. *Reduced further to a straight time labor basis, it would amount to about* $200,000,000 *on a prewar basis. Estimating domestic consumption for the next year on a prewar basis at* $100,000,000—*it surely cannot be more—we have a surplus left for export of an equal amount, or* $100,000,000, *prewar value.*

Already governmental purchasing organizations in France, England, Belgium and Italy, have been created, whose duties are to vise most carefully and cautiously every item to be imported. National patriotism will be brought into play and the native houses importing goods from other countries, are in duty bound to buy what is needed in their own country if they possibly can.

English Builders Form Society

In France they already have been asked to do this. In England leading manufacturers of machine tools have formed an alliance for the purpose of creating a world-selling organization of their own. It is called the Associated British Machine Tool Manufacturers, Ltd, with headquarters at 34 Victoria street, London, and comprises the following English manufacturers of machine tools: Archdale & Co., Ltd.; Asquith, Ltd.; Butler & Co.; Churchill Machine Co.; Kendall & Gent; Lang & Sons; Parkinson & Sons; Richards & Co.; Shanks & Coventry, and Ward & Co.

They say in their circular:

SELLING ORGANIZATION: Having made satisfactory arrangements regarding the production of the best possible machines, and being firmly convinced that British machine toolmakers can offer and supply machines of the highest quality, equal to if not better than those of any other country, the company is making every effort to establish an efficient sales organization to further British trade in all parts of the world.

OVERSEAS MARKETS: It is a matter of common knowledge that British machine toolmakers have not been represented in overseas markets in the past by thoroughly competent agents, and that their interests have suffered severely in consequence. It has been decided therefore that the Associated British Machine Tool Manufacturers should open its own branch offices, where there is a sufficiently large demand for its products. This already has been done in France and Italy, and other branches will be opened as circumstances will permit, each branch having a competent engineer as manager, also machine tool expert representatives appointed after careful selection.

Expects Satisfactory Trade Treaties

This tells you what your competitors in England are getting ready to do. For the present we can only hope to sell in those countries the things that are actually and immediately needed. Their doors today are practically closed against everything but raw material. When this ban is removed, and we can reasonably expect that new trade treaties growing out of the peace conference will force it to be at least modified, we will need to have real American selling organizations on the job. These are necessary to insure the fullest loyalty to American goods and the characteristic zest and industry in the art of selling.

If there was an incentive before the war to Germany to test the market with our machines and then make those machines herself, the incentive now is a hundredfold greater. If any nation before the war could regulate the amount of American exports of machinery by controlling their sale, its incentive to do likewise, now that the war is over, is a thousandfold greater. It is a formidable barrier to foreign trade expansion that a manufacturer builds around himself when he entrusts his foreign selling to any foreigner. England and Germany followed no such method and these nations have engaged in foreign trading for hundreds of years and, as all admit, are past masters in the art.

Program for United States

The United States should be prepared with her own sales organizations. She should have her own export houses with selling branches in all markets of the world. She must assume the task of disposing of her own manufactured products. Herein then lies the answer to the manufacturer who asks: "What can I do to strengthen the nation's trade with foreign countries?" He must insist upon selling through American houses. He must insist so hard that an adequate number of such houses will be established to take care of his foreign business. The Webb bill provides for the creation of group selling organizations by manufacturers. Under its provisions also export houses can join with manufacturers for foreign trading.

A movement of this kind on the part of our manufacturers will encourage the establishment of American houses in foreign countries. They in turn will encourage the establishment of banking facilities. Banking facilities will encourage investment in foreign securities and industries and, as these grow in size and number, the circle of America's influence will likewise grow to vast and, we may say, almost limitless proportions.

Fix New Extras on Heavy Galvanized Sheets

A table of extras on galvanized steel sheets for weights heavier than regular commercial coatings has just been compiled and put into effect by the sheet manufacturers. These extras, per 100 pounds based on a weight test and 5-cent spelter are as follows:

Gage	Commercial coatings		1.50 to 1.75 oz. per sq. ft.	Over 1.75 to 2.00 oz. per sq. ft.	Over 2.00 to 2.25 oz. per sq. ft.	Over 2.25 to 2.50 oz. per sq. ft.	Over 2.50 to 2.75 oz. per sq. ft.
30	Add	.50	.40	.60	.80	1.00	1.20
29	Add	.25	.40	.60	.80	1.00	1.20
28	(C/L quantities)	Base	.40	.60	.80	1.00	1.20
27	Deduct	.15	.40	.60	.80	1.00	1.20
25–26	Deduct	.30	.40	.60	.80	1.00	1.20
22–24	Deduct	.45	.25	.35	.45	.55	.65
17–21	Deduct	.60	.25	.35	.45	.55	.65
15–16	Deduct	.75	.15	.20	.25	.30	.35
12–14	Deduct	.90	None	.20	.25	.30	.35
10–11	Deduct	1.00	None	.20	.25	.30	.35

FOR ADDITIONAL ADVANCES OF 1c PER POUND FOR SPELTER

When spelter is 6c per pound add 20 per cent to extras for coating stipulated.
When spelter is 7c per pound add 40 per cent to extras for coating stipulated.
When spelter is 8c per pound add 60 per cent to extras for coating stipulated.
When spelter is 9c per pound add 80 per cent to extras for coating stipulated.
When spelter is 10c per pound add 100 per cent to extras for coating stipulated.

Determination of coating by weight test usually is conducted by weighing a quantity of dry sheets immediately before and promptly after galvanizing, so that the amount of spelter distributed over the total area of the sheets used for the tests can be estimated in terms of per square foot.

Determination of coating by spot test usually is conducted by the lead acetate method. It is understood by the galvanizer that the lightest spot on any sheet must not fall below the stipulated minimum called for by the specification. Twenty-five per cent is to be added to the gross extra for the stipulated coating.

Alloy for Contract Points

A metallic alloy comprising nickel and tungsten with a considerable amount of carbon was patented recently by Henry K. Sandell, Chicago. It is said that this material is particularly adapted for the manufacture of contact points used in electrical work.

Briefly stated, the appartus used in making the alloy consists of a carbon block having a trough in its upper surface which serves as a crucible for the production of the material. The crucible is heated by internally developed heat which is generated by an electric current. It is said that an alternating current gives the best results.

The metals to be combined should be of a pure state, it is pointed out, to yield the best results. After the metals are placed in the crucible, the latter is raised to a temperature sufficient to cause them to fuse. Powdered amorphous carbon, or powdered graphitic carbon, is then added to the fused mass, during which time the molten alloy is stirred with a carbon stirring rod.

Shortly after the carbon has been added, the mixture solidifies or sets and the process is at an end. The current is now turned off, the crucible permitted to cool and the pig of alloy removed. To fabricate the material into contact points it can be filed, machined or ground.

It is said that this process produces a metal composition that is substantially homogeneous throughout its mass and which upon analysis shows a percentage of carbon by weight of from 2½ to 7 per cent.

The Jones & Laughlin Steel Co., Pittsburgh, preparatory to the construction of 300 coke ovens at its Eliza department, has applied to the Pittsburgh building inspector for the essential building permits. The applications call for work to cost $389,000. The H. Koppers Co., Pittsburgh, has the contract for the construction of the ovens.

Show Progress of Big Gun Program

War Department Officials Disclose Status of Ordnance Work on Inspection Trip to Prooving Grounds—Production of Cannon, Tractors and Tanks Was Approaching Capacity

WASHINGTON, Dec. 24.—Revealing vast accomplishments that had been brought about and the still greater ones that were under way by the government in building up a gigantic war machine, Assistant Secretary of the War Benedict Crowell and army officers last week conducted newspaper correspondents over the proving grounds near Aberdeen, Md. At these grounds, the largest of the kind in the world, consisting of 36,000 acres, with 5000 enlisted men, 300 officers and 2000 civilians, was given active demonstration of weapons of war of all kinds. Some of the types already had seen service in France and others were about ready to be rushed to the battle line, with an unlimited number and great variety of still others to follow had the hostilities continued. The exhibition seen gave a good index to the plans of the war department to produce 2000 guns of all calibers a month, without disturbing the supply going to the allies or being made for the navy, which had priority in production. Already, the production had mounted up to 500 a month and the maximum rate fixed would have been reached by next June or July.

Nor did the visit fail to give a clear idea as to where immense tonnages of steel were going, or what part of the industry was doing in the way of fabricating work to build weapons. There was shown guns of all kinds, from the machine gun to the 12, 14, and 16-inch rifles, which were fired down the long ranges landing in Chesapeake bay, on which the grounds are situated, the 14-inch gun, railroad mounted, firing a distance of 28 miles. This gun was mounted on a huge railroad car, especially designed and built in this country, work of building the carriage being done by the Morgan Engineering Co., Alliance, O., while the fabrication work was done by the American Bridge Co., Pittsburgh, while the Bethlehem Steel Co. built this as well as other large types of guns.

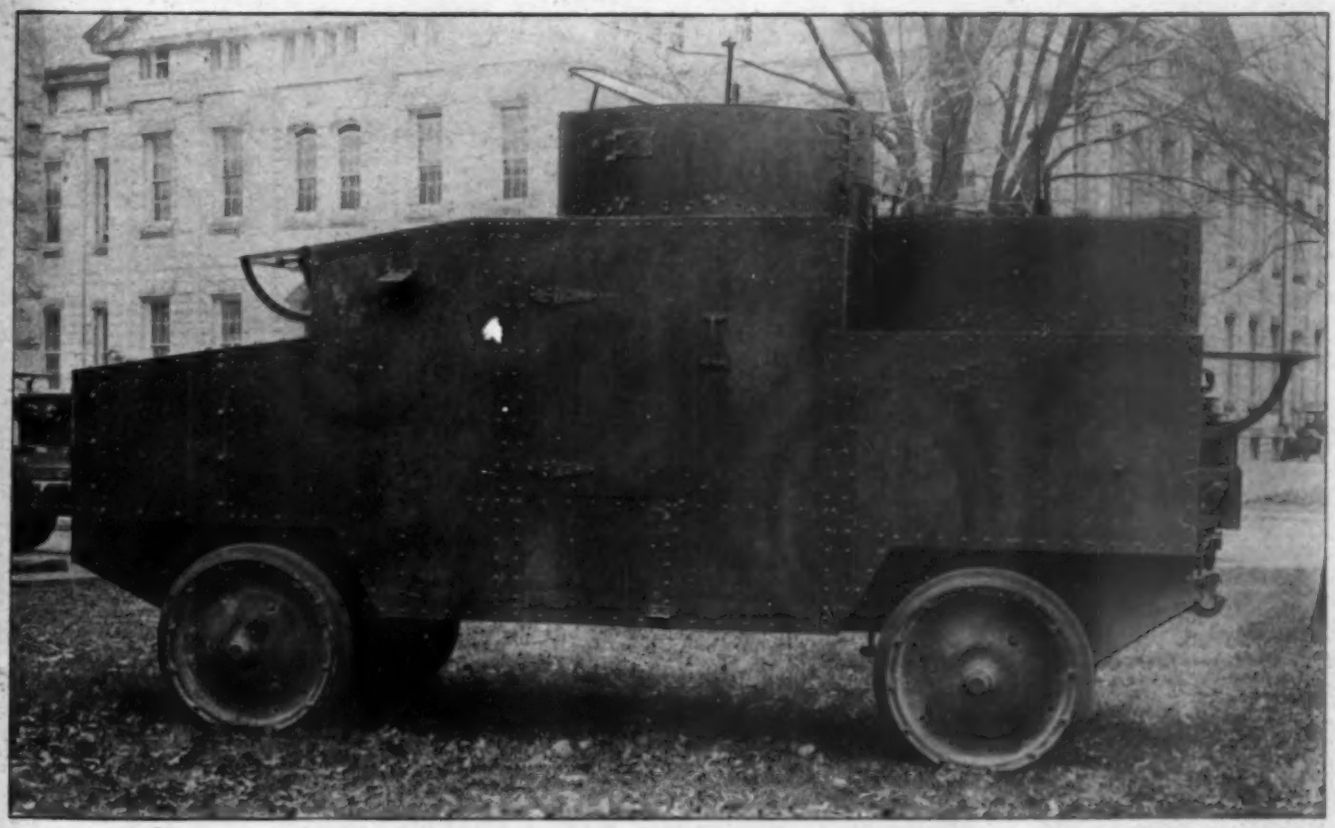
Howitzer Production Large

Gun forgings and completed guns, it was stated by Mr. Crowell, were being turned out at a good rate in this country, and shipments going overseas, those to the French armies having attained a rate of 1000 a month. It also was stated that the 155-millimeter howitzer output had passed the estimated requirements for the proposed army of 4,000,000 American soldiers and an excess of 600 were sold to France.

Mounted on specially designed railroad carriages were a 16-inch mortar and a 16-inch howitzer, which were fired and ready to move away to evade a return fire. On the specially arranged railroad mount was the 14-inch rifle with no recoil, which was taken up by a reverse movement of 48 inches of the massive carriage. Purely an American product, it was the intention of the war department to turn out this class of railroad mounts altogether, thus insuring speedier production by reason of not having to build recoil mechanism.

This government, Mr. Crowell said, had built up a heavy bank of reserve ammunition when the armistice was signed. For the 75's alone more than 15,000,000 rounds are on hand, and this will be doubled before the contemplated reserve is completed. It is planned to keep 15 per cent of these loaded. Upon the starting of the German drive last March, France had 63,000,000 rounds for her 75's in reserve. When the armistice was signed this supply had been reduced to 15,000,000 rounds, and a call was made on the United States for 2,500,000 rounds for these guns each month. In October, this country delivered 2,000,000 rounds in France and had another 3,000,000 rounds on docks awaiting shipment. The monthly output in the United States had reached 3,500,000 rounds a month and was increasing steadily.

Display of artillery tanks and tractors constituted an interesting part



ARMORED AUTOMOBILE DEVELOPED FOR USE BY THE AMERICAN ARMY

of the program. The matter of supplying a great quantity and many types of motor equipment such as tractors, tanks and trucks was one of the tasks assigned to the ordnance department. Its work was to design and have built all the trucks that the army needed to transport its ammunition which incidentally required about as many trucks as all other branches of the service combined; design and build all the tractors required to pull its guns, and all the tanks needed to have fleets of landships. It is understood that there are between 50,000 and 60,000 American built trucks in France which had been shipped for the use of the American forces and that recommendation has been made that they be sold to the French government.

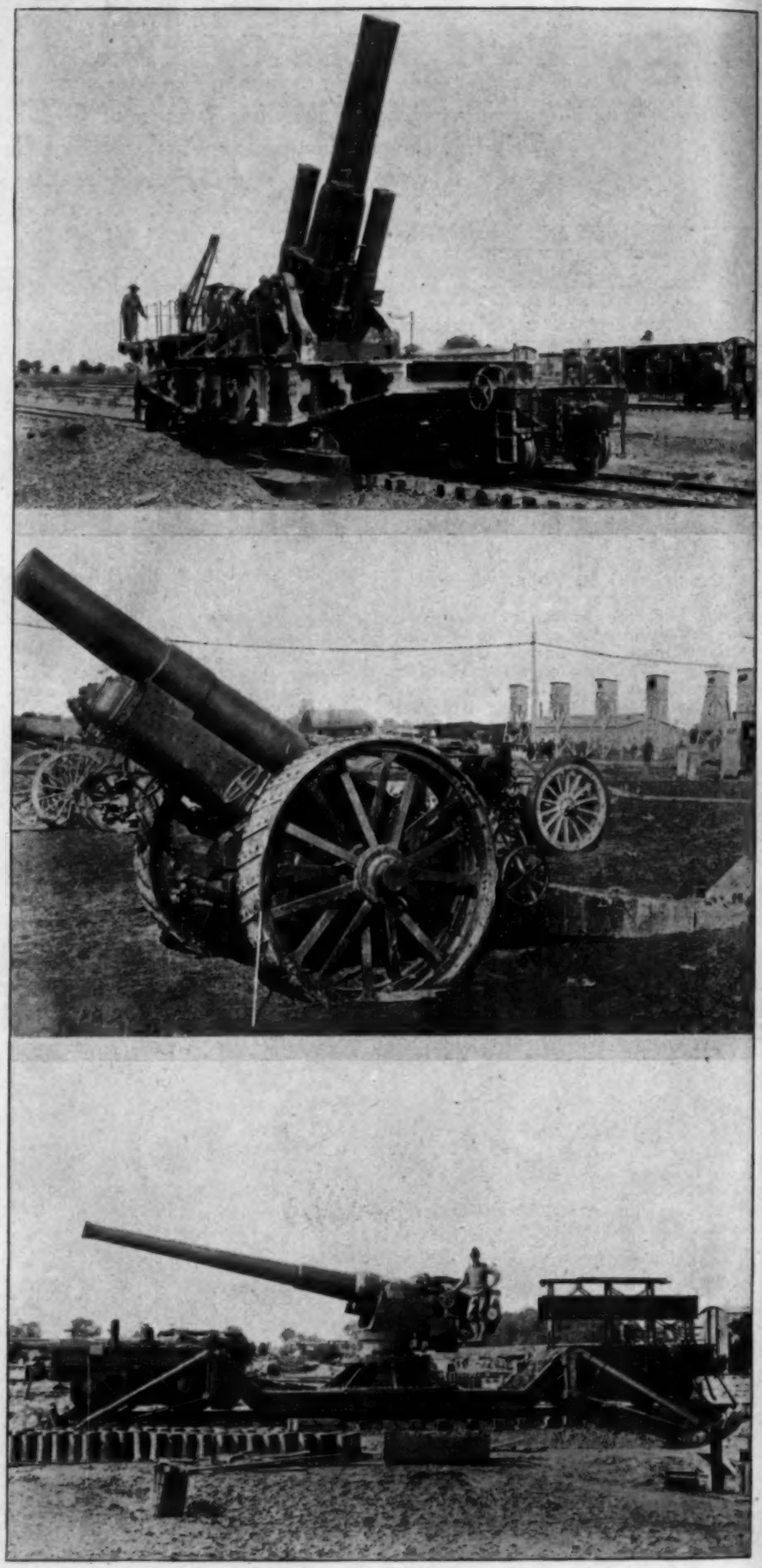
The most urgent need was for ammunition trucks, so the two best commercial types of four-wheel drive trucks were chosen. They were put in production simultaneously in eight large factories. These trucks were among the first shipped to France.

Mobilize Big Guns

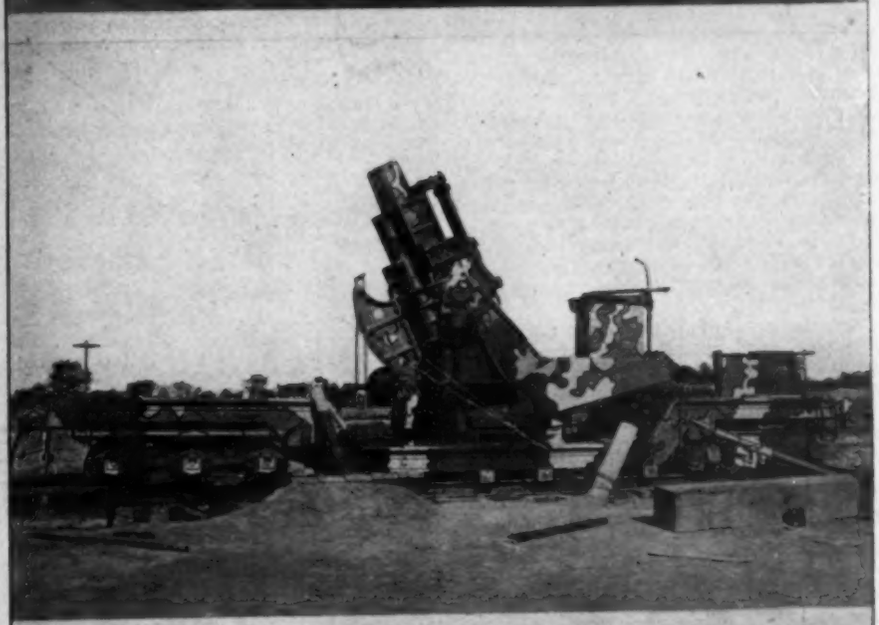
Tractors were needed just as badly as ammunition trucks so as to move artillery, the advance of infantry depending upon the mobility of artillery. The experience of the allies disclosed that only the crawler or track laying type of tractor could operate over shell broken ground and over the sea of mud in northern France. The capacity of the tractor manufacturers, 15 months ago, was small, and the army requirements large. So some of the largest automobile concerns in the middle west were shown how to make tractors. And they did—in four sizes; a size for each type of artillery from the 3-inch piece up to the largest howitzers.

While that which was available was being made there was in process of design a series of specially developed army tractors: The 2½-ton size that was to haul the French type 75-millimeter at 10 miles an hour, production of which had just started; the 5-ton taking a 4.7 or lumbering 155-millimeter howitzer anywhere at better than seven miles an hour, which was demonstrated at the proving grounds, and which was driven from Detroit under its own power; and two larger sizes, the 10-ton tractor, which with an 8-inch howitzer plowed over the fields, knocked down trees, taking a short cut through woods and across ditches to the firing range, and the 20-ton tractor.

Mr. Crowell stated that of the 1858 5-ton tractors that had been produced, 450 had been shipped to France; of the 128 20-ton tractors, 81 had been sent overseas, one of this type having traveled under its own power to the proving ground from Peoria, Ill. Of the 10-ton tractors, 1541 had been produced, but none shipped. One of these tractors, as demonstrating its strength, pushed over a tree 17 inches in diameter. This tractor weighs 55,000 pounds. It required only 65 days to design and deliver this tractor and to mount the howitzer upon it for firing. While shipments of this type had been made to France it had not been used in battle. The tractor went to Washington from the proving grounds, a distance of 80 miles, at the rate of three miles an hour. When it came to bridges not strong enough to sus-



ABOVE, 16-INCH RAILROAD MOUNT, CAMOUFLAGED HOWITZER; CENTER, 8-INCH HOWITZER, AND (BELOW), 6-INCH RIFLE ON RAILROAD MOUNT—THE 16-INCH HOWITZER CAN BE FIRED UP TO A 45-DEGREE ELEVATION—ITS FIRING RANGE IS APPROXIMATELY 13 MILES



ABOVE, 155-MILLIMETER FIELD GUN OF AMERICAN DESIGN; CENTER, 8-INCH HOWITZER ON RAILROAD MOUNT, AND (BELOW) 9.2-INCH BRITISH HOWITZER BUILT BY THE AMERICAN ORDNANCE DEPARTMENT—RAILROAD ARTILLERY HAS SIMPLIFIED THE PROBLEM OF DEFENDING OUR SEABOARD

tain its weight, it went around them, passing through the ravines and ditches. The production of 10-ton and 5-ton tractors had attained a rate of 40 a day.

When it came to tanks the best allied practice was followed. For a medium size tank the ordnance department looked to France and using American methods put into production a two-man tank of similar design to the Renault 6-ton tractor. Demonstration of this two-man, 3-ton tank, carrying a 6-inch gun, was given. This tank was being produced at the Ford plant, about 150 having been turned out and beginning the first of January, the output was to proceed at the rate of 100 a day. Of the 6-ton American-Renaults parts of 643 had been made for use in France and 6000 were in process of manufacture. The motive power, including motors, it is understood, was manufactured in this country, while the armor and shoes were being made in England. Land battleships were essential—great 35-ton machines. England had them. So England's aid was sought and England together with the United States designed the Mark VIII. This tank was built on a joint production program between the two countries. Due to this co-operation within a surprisingly short time there was being made in this country a type of 35-ton tank equipped with light artillery, machine guns, and wireless apparatus.

Tank Engine is Problem

The tank is no better than its engine. The big problem that confronted the ordnance department in connection with the manufacture of a large tank was to get an engine that could be made in quantity in this country. The type of engine the English used could not. But automobile plants were turning out the 12-cylinder Liberty aircraft motor. The question was, would an aviation motor work in a tank? Tests disclosed it would—admirably. So it was adopted and America's largest tank is propelled by a Liberty 12 aircraft motor. This fact alone settled all argument as to the adaptability and suitability of the Liberty 12.

The ordnance department did not rest with using the best European design. It went ahead and designed an essentially American tank, for two men, previously referred to, that would advance at a rate of 15 miles an hour. These were called the "baby" tanks, which the Ford plant was to produce at the rate of 100 a day beginning with the first of the new year.

It was evident months before it happened, that eventually the American army must stage an offensive on an unprecedented scale. The ordnance department laid plans accordingly. Instead of having the tractor haul the gun, a special type of tractor was designed, on which the gun was mounted. That meant the elimination of time lost, in limbering, unlimbering and setting the gun up—the gun always would be ready. Hence the ordnance department completed designs for mounting the 75-milimeter on tractors with a road speed of 15 miles an hour—in other words, by merely pulling a lever and pushing a pedal, the gun is off, ready to advance five times as fast as the infantry could follow it.

Season's Ore Mark is Satisfactory

Record Preceding Year Probably Would Have Been Surpassed Had the Final Movement Not Been Cut Down—Much Development Work Planned for Winter —Duluth Expects Steel Corporation Plant Development

DULUTH, Dec. 21.—That the iron ore shipping record for the Lake Superior district for the season ended Nov. 30 should have so closely approached the 1917 figures is regarded as entirely satisfactory by officials of the mining companies. Last year's record might have been surpassed had it not been for the decision of the iron ore committee and the vessel interests to shut down earlier than usual and to hold back the shipping of 2,000,000 tons of ore in order that the vessels of the Pittsburgh Steel Co., the Shenango Furnace Co., Pickands-Mather & Co. and other interests, might be diverted to the grain trade in which there was serious congestion here and in Buffalo.

Large forces are being employed this winter on the ranges in development work and mining. The Oliver Mining Co. is setting the pace with a force of nearly 12,000 men. Preparations are being made by the company to transfer a portion of the residence and business section of Hibbing to Alice that valuable iron deposits within the village limits may be worked. The company has acquired possession of land and buildings in Hibbing and will soon let contracts for a number of mercantile buildings and many houses in Alice, known as the central addition. Plans for the buildings are now in preparation by S. S. Rumsey, the company's chief engineer.

The Republic Iron & Steel Co. is employing more than 800 men at its properties on the ranges, including its three underground mines at Gilbert and Virginia, the Bray at Keewatin, Minn., and the Clifford at Iron Mountain, Mich. West of Hurley, Wis., the company is exploring the Plumer mine and has eight diamond drills at work.

On the Cuyuna range, John A. Savage & Co. are developing the Sagamore, a manganiferous mine located near Riverton, Minn. A contract for stripping it has been let to Winton & Dear of Hibbing, Minn. Generally speaking, however, operations on the Cuyuna range are being curtailed at present because of uncertainty regarding iron ore prices likely to prevail next season. Operators are sanguine that a good demand will develop for Cuyuna range manganiferous ores under peace conditions and several new mines are expected to enter the shipping list next spring.

Favor Higher Prices

The agitation for a readjustment of iron ore prices upward next season to bring them in line with present operating costs is gaining ground here. An advance of at least $1 a ton is being urged as reasonable. It is claimed independent producers without furnace connections are unable to show any margin of profit on the present basis of prices and costs, and that unless revisions are made many mines will not resume productions next spring. Practically none of the nonbessemer underground mines on the three Minnesota ranges are doing any stockpiling this winter as the operators contend the cost of the ore on the surface is more than they can obtain for it.

A proposal by the East Mesaba Syndicate to establish a plant on the East Mesaba range to extract low grade ores by a magnetic process is being considered and may be carried through next season. An experimental plant to test the process has been in operation in Duluth during the last two years under the superintendence of W. G. Swart, mining engineer, and is said to have been demonstrated to the satisfaction of the capitalists interested. A carload of the ore treated at the plant was recently shipped to the Midvale Steel & Ordnance Co. at Coatesville, Pa. It assayed 63.27 per cent iron dry; 3.00 per cent moisture and showed only 0.008 per cent phosphorus. More than 6000 tons of that low grade ore were treated at the experimental plant here last season and were shipped to an eastern furnace.

Operators of steel working industries and mining properties are looking forward to an easy labor situation next year. Officials of the mining companies operating on the Minnesota ranges have announced that former employes who entered the service will be given their jobs back. Women employed in office work by some of the companies in place of men are gradually let out that vacancies may be created for returned soldiers. The Oliver Mining Co., which had a large force of women in its employ during the last year, has already materially reduced the number.

Await Corporation Mill Development

While nothing further has as yet developed regarding the United States Steel Corp.'s plan to establish four plants to manufacture finished steel products including a nail mill, wire mill, tin plate mill and a sheet mill to utilize the billets made at the Minnesota Steel Co.'s furnaces, it is presumed that an announcement will be made soon, in view of the necessity of heading off any tonnage tax legislation that may be introduced at the session of the Minnesota state legislature which will open Jan. 7. It is said that any such enactments will be opposed by members of Duluth's civic committees, provided assurances are given by Steel corporation officials that its proposed industrial developments, as outlined, will not be delayed. Members of the Duluth basic steel price committee claim Judge E. H. Gary said that the corporation intended to proceed with the establishing of the proposed additional plants at this point "as soon as war restrictions have passed and business has again become normal." It is now believed that with the removal of the restrictions against the sale of steel products and the ending of the war, a more definite statement regarding the corporation's plans is due.

The Minnesota Steel Co.'s blast and open-hearth furnaces and coke ovens are being operated at full capacity with a force of approximately 3500 men. At the Universal Portland Cement Co.'s plant, adjoining the furnaces, 300 men are employed. During the last 18 months, the bulk of the semi-finished steel turned out by the furnaces has been disposed of for munitions, but the business interests in this city were gratified to learn recently that the output has been contracted for in other quarters since the signing of the armistice. Operation of the company's large rail mill is now reported to be among the possibilities in the near future.

Minerals Produced in 1917 Valued at Five Billion

Minerals produced in the United States in 1917, according to the United States geological survey, department of the interior, had a value of $5,010,948,000. This shows an increase of $1,496,976,000, or about 43 per cent, over the former record of $3,513,972,000, established in 1916. Pig iron, ferroalloys, copper, coal, and petroleum contributed 74 per cent of the total value of minerals produced and 88 per cent of the increase in 1917.

Metals established a new record in 1917, being valued at approximately $2,092,000,000 and representing 42 per cent of the total value of the mineral product. This means an increase of about $471,316,000, or 29 per cent, over the $1,620,508,000 reported for 1916. Blast furnace products contributed nearly 90 per cent of the total increase. Increases were also made in the value of aluminum, copper, lead, and silver, but decreases were recorded in the value of gold and and zinc.

The value of the nonmetallic products in 1917 was 58 per cent of the value of all minerals produced, increasing $1,010,459,000, or nearly 54 per cent, from the former record of $1,878,464,000 in 1916 to $2,888,923,000 in 1917. Of this total increase coal alone represented nearly 66 per cent, and coal and petroleum combined contributed about 85 per cent.

The Industrial Gas & Chemical Co. recently was organized and incorporated under the laws of Ohio, with a capital of $250,000, for the purpose of erecting and operating a plant in Sharon, Pa., for the manufacture of industrial welding gases, chemicals. Present headquarters of the company are at Youngstown, O., but with the completion of the plant, the offices will be located at Sharon.

Britain Retains Firm Grip on Prices

Ministry of Munitions Takes Action to Guard Against Dangerous Slump in Market —Extensive Plans Pushed for Domestic Construction—Demand for Steel Falls Off—Tanks Are Cut Up for Scrap

Bureau of THE IRON TRADE REVIEW,
Prince's Chambers, Corporation St.,
Birmingham, Eng., Dec. 10.

THE iron markets are gradually assuming a prewar appearance. For many months attendance thereat was a mere formality, the system of government control leaving no opportunity for individuality either in purchase or sale. The situation has suddenly become interesting, if not critical. The most varied judgments are expressed as to the probable course of business, the attitude ranging from exaggerated optimism to timid pessimism.

The market in Birmingham is now better attended than for a long time past. There is considerable consultation among pig iron makers owing to a rumor to which credence appears to have been given that the government proposes to discontinue the subsidy it has for some time past allowed to makers of pig iron. It is stated that this is to be withdrawn as from Dec. 1. Strangely, nothing has been heard of the intention of the authorities with regard to the subsidies also allowed in regard to coke and ore. The matter is of great interest, not only to the smelter but to his customer, because if the government allowance of £1 ($4.80) to 30/ ($7.20) per ton to recoup losses on production is withdrawn the smelter will be compelled to turn to his customer to make up the difference. Wages also would be affected and the change would involve considerable dislocation of trade. The rumor had the effect of stimulating buying, although a great many pig iron consumers still adopt a cautious "wait and see" attitude.

It was commonly reported that forge iron could be bought somewhat below maximum prices. The case is totally different with foundry iron, which is still given out in lots ranging between 100 and 200 tons. The determining element in this case seems to be the large number of castings still wanted in connection with shipbuilding, while there is a prospective call for considerable machinery. For the present output is below the average, partly on account of the prevalent epidemic, but still more through fuel scarcity. The peace celebrations in which the miners participated caused a great gap in the coal supply. The pits also are being depleted of labor by the epidemic, and some blast furnaces in consequence have had to be put on slack blast.

Demand for Steel Reduced

In the Cleveland district the falling off in the demand for controlled iron as a result of the armistice is very marked. In that district furnaces were damped down for three days for peace festivities. Forge iron is increasing enabling the smelters to accept offered contracts for substantial tonnages running well into the next quarter. Shipments have not yet responded to peace conditions, although a big recovery of exports is looked for, following the disappearance of the submarine menace and the great reduction in the cost of freights and insurance. Manufacturers look to this as a sure means of compensating for the loss of purely war business. The reduced demand for steel has had its influence at the hematite furnaces which now appear to be well able to cope with the demand.

The lapse of several weeks since the signing of the armistice has enabled the heads of the iron trade to take stock of the situation. On the whole, all parties are reassured, although there is full recognition of the fact that cancellations have not yet become serious. The signs of new business increase daily and offers are of a very substantial character. Amid rival judgments, the optimistic view appears to be slowly but surely prevailing. Such measures as the government has taken indicate a determination to maintain a sufficiently firm hold on the market to prevent a dangerous slumping of price. The ministry of munitions has already given notice that all deliveries of steel for export must continue to be made at prices fixed by the ministry.

The keen interest taken by Lloyd George in the maintenance of wages over a reasonable period has introduced another element of firmness. There has been a certain relaxation in the iron and steel regulations, full details of which are to be published soon, but in the meantime manufacturers are at liberty, subject to the existing priority of work order, to use in manufacture, whether for stock or otherwise, any iron, steel or nonferrous metals which they have already acquired by purchase and have in stock. They also are subject to any existing restriction as to price in accepting any orders for manufacture requiring the use of such iron, steel or nonferrous metals.

Retain Control Over Prices

It will be observed that the control over price is retained, which is the matter about which manufacturers are mainly concerned.

The ministry still requires to be informed what work is being carried through. This partial measure of liberation has already had a wholesome effect in bringing out a lot of new business. In Birmingham there is plenty of talk of liberal offers of orders running into many thousands of tons. One contract related to 10,000 tons of bars for reinforced concrete and this is understood to be only a beginning.

Extensive plans have been in progress for some time with a view to pushing house building at the earliest possible moment, the shortage of houses constituting an inconvenience and a danger. Some good orders have been placed for warehouse renewals. One of the largest Birmingham merchants, being exceedingly optimistic and having the courage of his convictions, went to leading Black country works and placed orders to the full extent of their willingness to accept. As his customers' demand for this material, chiefly round bars ranging from ½ to 1 inch is almost unlimited, he considers himself on safe ground, and the substantial deliveries he has already obtained have gone directly to his customers.

There is a good deal of inquiry for colonial requirements, Australian exporting merchants being anxious to place their business. All the great steelmaking firms are still turning down substantial offers of business relative to ship plates and sections for use in Canadian yards, as well as Australian and Japanese shipbuilding yards.

Cancellations are becoming more numerous, especially for munition steel, airplane material and light sheeting of the kind used for soldiers' water bottles, magazine pans and similar equipment. But in every instance makers have been able immediately to turn to commercial production to meet the wants of impatient customers. Buyers of tinned sheets who for a year at least have been practically excluded from consideration owing to the imperious demand for aircraft material are now obtaining supplies. A vast amount of business is waiting to be done in this department. The same is true of light hollowware for which Birmingham is an important center. This trade looks to get a substantial revival now that light and high-class sheet can be obtained.

To Sell Tanks as Scrap

An important element in the situation has to do with the vast quantities of scrap known to be waiting distribution from the French and other battlefields. Tanks, having in their present form no conceivable utility in time of peace, must be broken up and sold as scrap. A number of broken tanks were on offer at Leicester a few days ago and scrap dealers were invited to bid. They adopted a waiting attitude believing these vast tonnages must inevitably depress the market whenever they are liberated. Strong hope is expressed that the government will offer them in such quantities and with sufficient intervals to prevent a slump.

We have not had long to wait after the armistice for a renewal of strikes. About 50,000 men threatened a strike three days ago near Middlesbrough and 10,000 men actually quit. They are all members of the steelmakers' and steel smelters' union and for a time it appeared as if the whole of the steel works from

the Tees to Tyneside would be laid idle. The men are dissatisfied with an advance awarded by the committee on production, although it is authoritatively stated that the sample passers who are the men most concerned, already get an average wage of £20 ($96) a week. For the present the men have been induced to resume work on the understanding that representatives of the ministry of munitions and employers will discuss the questions in dispute.

The significance of the allies' occupation of Alsace-Lorraine has not been overlooked in the British steel trade. It will be remembered that in 1917 the German government defiantly proclaimed that the return of Alsace-Lorraine would never be discussed with a foreign power. It was well understood at that time that the Germans had in mind the great value of the Lorraine iron ore fields which have now passed formally out of German possession. According to the estimate of German iron resources by Einecke-Kohler, the Lorraine ore field accounts for approximately 2,000,000,000 of Germany's prewar 2,840,000,000 tons of "ore in sight" and for 500,000,000 tons of the 1,000,000,000 tons described as "probable further reserves." The loss of Alsace-Lorraine, therefore, cuts down Germany's iron ore resources to about one-third of their prewar volume. The reoccupation of the Briey-Longwy fields takes from Germany ore resources estimated at about the quantity it has lost in Lorraine, that is 2,000,000,000 tons.

Will Improve Mill

Extensive improvements are being made to the plant of the Sligo Iron & Steel Co., Connellsville, Pa., which now is owned by the Commercial Iron & Steel Corp., 42 Broadway, New York City. It is anticipated that the entire 19 puddling furnaces will be in operation at an early date, working on three shifts. The plate mill and the 9-inch and 16-inch bar mills will be placed on a two-shift basis immediately. Particular attention is to be paid to export trade as soon as war requirements are satisfied. W. P. Mullane, who for 17 years was affiliated with the Republic Iron & Steel Co., and for the last five years was superintendent of its Sylvan works at Moline, Ill., has been appointed general superintendent.

Pittsburgh Foundrymen in Chrismas Convention

Pittsburgh, Dec. 24.—True to tradition, the Christmas celebration of the Pittsburgh Foundrymen's association, held last week at the Pittsburgh Athletic association clubhouse, was 100 per cent enjoyable. A. O. Backert, president of the American Foundrymen's association was the guest of the association and delivered an interesting talk in which he touched upon the efforts of the government to start the production of semisteel shells, his experiences at the government testing grounds at Aberdeen, Md., and closed by warning the foundrymen that there was danger in expecting too much of a drop in pig iron prices on the recommendation of the American Iron and Steel institute alone. He declared that iron producing costs now were almost equal to selling prices and gave it as his opinion that a good many stacks would be blown out and production checked by materially lower prices than now prevail. Aquatic events and boxing bouts were provided following Mr. Backert's talk, the former under the direction of W. E. Curwen, swimming director of the Pittsburgh Athletic association and the latter being directed by the old time professional boxer Joe Choynski. The entire affair was in charge of the entertainment committee, which is composed of J. S. McCormick of the J. S. McCormick Co., chairman; W. W. Sanderson, of the Carborundum Co.; C. W. Howat, of the Union Steel Casting So., and T. E. Malone, of the J. S. McCormick Co.

Issues 1919 Calendar

Each one of the 12 new 8 x 15-inch views which are incorporated in the 1919 calendar just issued by the Youngstown Sheet & Tube Co., Youngstown, O., shows one of the spectacular operations of a modern steel mill. The illustration on the front page is a night view of the main plant while it was speeded up on war work and flood-lighted as a wartime precaution. Publicity department of the company is distributing copies at postage cost.

Adding Steel Capacity

Construction work has been started by the McKinney Steel Co. on two additional open hearth furnaces of 100 tons capacity. When these are completed the entire steel plant of the company will consist of 14 furnaces of the 100-ton size. The company several months earlier in the past year put in operation an additional block of six furnaces. The extension now under way therefore is the third extension to the original plant.

Plan Standards Body

The American Society for Testing Materials has voted to participate in the organization of an American Engineering Standards committee and it will be represented on this committee by past presidents A. A. Stevenson, Standard Steel Co., Philadelphia; A. W. Gibbs, Pennsylvania railroad, Philadelphia, and J. A. Capp, chief of the testing laboratory, General Electric Co., Schenectady, N. Y.

Changes Its Title

The American Museum of Safety has changed its name to the Safety Institute of America. The trustees have announced an extension of the institute and the enlargement of its activities for the coming year. Officers for the year are: President, Arthur Williams; secretary, Dr. William J. Moran; treasurer, James Speyer; vice presidents, E. H. Gary, Mrs. E. H. Harriman, Charles E. Hughes, Dr. William H. Nichols and B. B. Thayer.

Canada Keeps Busy

On Peace-Time Production, With All Munition Contracts Cancelled

Toronto, Ont., Dec. 21.—Nearly every munition contract in Canada has been cancelled and companies making munitions will cease operations in this line before the first of the year. Contracts for 12-inch American shells have been withdrawn. Manufacturing concerns which were just getting their plants in order to start work on these shells cancelled their orders for large machine tools. With the dropping of the munition contracts business has been thrown into a rather demoralized state and will take some time to readjust. Now that the demand for tools and machinery used in the manufacture of war materials is falling off, equipment required for the production of domestic articles is coming to the fore. Dealers do not anticipate any depression among tool and machinery industries. It is expected that there will be a good demand for woodworking and mining equipment.

As a great part of the mining business carried on around Cobalt, Porcupine and other centers in this vicinity, is mainly a peace industry, companies will now go ahead with development work and it will be necessary to greatly increase their present working facilities. The dominion government has decided to spend vast sums on its railways both for rails and rolling stock. In addition to this the authorities at Ottawa are making preparations to go ahead with other public works, such as waterworks plants, harbor improvements, electrical development, etc., on which the government will spend millions of dollars.

Canadian industrial concerns are taking an optimistic view of the outlook and do not anticipate any great decrease in their earnings for the year 1919. Manufacturers are "taking the bit in their teeth" and are losing no time in getting their plants ready for post-war business. There is plenty of foreign business in sight. Orders have been received in the dominion for agricultural implements, railway equipment, rolling stock, etc., from South Africa, New Zealand, France, Belgium and South American countries. There is also a good market in South China for iron and steel products of nearly every description. Dealers in this market which were formerly supplied by Germany are now looking to North America for their supplies.

State Administrators to Distribute Coke

Distribution of coke in each state has been placed under the direct control of each state fuel administrator, according to an announcement by the United States fuel administration.

An order to prevent any increase in the price of gashouse coke because of the recent advance of $1.05 in anthracite coal has been issued by the federal administration. The prices of gashouse coke in those districts where anthracite coal is obtainable is fixed on the basis of the prices of anthracite on Oct. 1, 1918.

Industries Board Ending Career

Affairs of Ramified Organization of Business Men Which Concentrated Productive Capacity of Country on War Essentials is Being Wound Up—All Priority Regulations Will be Revoked Jan. 1

WASHINGTON, Dec. 24.—The war industries board, which was the recruiting office and draft board for the industries of the country during the war, already has ceased to function although it does not officially terminate its duties and disband until midnight New Year's eve. More than three weeks ago the steel division and its pig iron and other sections discontinued making allocations of iron and steel and other departments of the board, even as early as Nov. 12, stopped operations. The work now being carried on by the remaining subdivisions of the board is merely that of winding up their affairs, preparing reports and statistics and determining the disposition of this data.

The most important action of the board or any of its divisions last week was the formal statement by Edwin B. Parker, priorities commissioner, that all rules, regulations and directions of the priorities division will be cancelled and revoked Jan. 1. The formal announcement simply completes the record of the division as the expiration of the board on the first of the year automatically would carry with it the termination of all such regulations. As most of the rules and regulations of other divisions of the board usually were made in conjunction with the priorities administration, the order of last week practically carries with it all mandates from any section.

Requirements Division May Continue

The requirements division, which has been passing upon contract cancellations, continues to operate in this capacity, although the policies of the various departments of the government on this phase of the readjustment problem are fairly well established. The work of this division may continue until congress has passed the necessary legislation applying to contracts. George N. Peek, acting chief of this division, is of the opinion, however, that his work will not go beyond the time set for the ending of the board's existence.

Chiefs of the various divisions and possibly some of their assistants will be busy for sometime after the board formally passes out, but their tasks will be only in compiling reports and possibly advising the old line departments of the government which will take over the records and some of the functions. The steel division, for example, is to receive reports on deliveries and obligations of steel tonnages by the manufacturers as of the various weekly periods terminating Jan. 1. The reports will be compiled and the statistics assembled for submission in a report by Chairman Baruch to the President and later for submission to the department of commerce which will preserve the data.

Nearly all the members of the board, the section and division heads, the experts, dollar-a-year men and employes will return to their prewar duties. Many of these have, however, broadened their experience and acquaintance to such a degree that new positions in commercial and industrial pursuits have been offered to them and some have been accepted. To what extent this transition will take place cannot be determined. The board is preparing a kind of memorial directory of the men who took active parts in the board's functions. This directory will show the position in the board and the prewar position of the incumbent.

Iron and Steel Men Leaving

J. Leonard Replogle, who has been steel director, is listed as president of the American Vanadium Co. Frank Purnell, assistant to the steel director, was manager of the order and sales department of the Youngstown Sheet & Tube Co. J. C. McLauchlan, chief of the pig iron section, is shown as a member of the firm of Pickands, Mather & Co., Cleveland. Leonard W. Williams, assistant pig iron chief, is vice president of Park & Williams, Inc., Philadelphia, pig iron brokers. Other listings in the steel division are as follows:

George M. Bartley, expert, is assistant sales manager of the Cleveland Steel Co., Cleveland; James S. Barclay, chief of the permit section, trustee of an estate in New York; A. A. Corey, expert, assistant general superintendent of the Youngstown Sheet & Tube Co.; J. W. Dickson, expert, pig iron section, Edmund W. Mudge Co., Pittsburgh; Everett D. Graff, special agent, assistant to the vice president of Joseph T. Ryerson & Son, Chicago; D. A. Holloran, expert, clerk in sales department of the La Belle Iron Works; John W. Horr, expert, assistant district manager at Boston for Bethlehem Steel Co.; Stephen R. Leonard, expert pig iron section, second vice president of Oneida Community, Ltd.; Raymond L. Lovell, expert, New York broker; Joseph A. McDonald, expert, vice president of the Clark Car Co., Pittsburgh; David F. Mann, expert, sales agent Pittsburgh Steel Co.; Richard Peters Jr., assistant chief scrap section, representing Rogers, Brown & Co. at Philadelphia; W. Vernon Phillips, chief scrap section, president F. R. Phillips & Sons, Philadelphia; Grafton H. Pyne, assistant, member of firm of Post & Flagg, New York; Philo B. Rhoades, assistant chief warehouse section, manager of warehouses for the Bourne-Fuller Co., Cleveland; Ralph I. Richardson, accountant, chief clerk of the Cambria Steel Co.; Geter C. Shidle, expert, selling agent in Pittsburgh office of La Belle Iron Works; Austin D. Smith, assistant in warehouse section, superintendent of warehouse for David H. Smith & Sons; Bertram S. Stephenson, expert pig iron section, resident manager of M. A. Hanna & Co. at Pittsburgh; Lewis R. Smith, expert pig iron section, salesman at Philadelphia for Matthew Addy Co.; Clinton G. Thomas, expert, president of the Western Reserve Steel Co.; Frank E. Thompson, expert, superintendent of the order department of Cambria Steel Co.; Capt. D. E. Sawyer, expert, salesman Block, Maloney & Co.; Herbert H. Weaver, expert with the Citizens Heat, Light & Power Co., Johnstown, Pa.; Frederick A. Weymouth, expert, metallurgical engineer with the Bethlehem Steel Co.; Andrew Wheeler, chief of the warehouse section, senior partner the Morris, Wheeler Co., Philadelphia; Percy K. Withey, statistician, of the sales department of the Lackawanna Steel Co., and Paul Mackall, foreign representative, assistant sales manager the Bethlehem Steel Co.

All Priorities End

"Effective Jan. 1, 1919, all the rules, regulations and directions of every nature whatsoever, issued by the priorities division of the war industries board are hereby cancelled and all pledges heretofore made on the suggestion or request of the said priorities division are hereby revoked."
—Edwin B. Parker, priorities commissioner.

Others on Board

Included among others who have held positions in the iron and steel and allied industries are: Henry H. Barbour, member priorities committee, manager of sales, the Lackawanna Steel Co. at New York; Samuel P. Bush, director of the facilities division and chief of the forgings, guns, etc., section, president of the Buckeye Steel Castings Co., Columbus, O.; George N. Armsby, chief of the tin section, vice president of the California Packing Corp.; Thomas F. Bailey, assistant to chief in hardware and handtool section, manager and treasurer of the Banks Supply Co., Huntington, W. Va.; Allan P. Bender, commercial engineer for the Westinghouse Electric & Mfg. Co., and Charles W. Bergen, New York representative of Ford & Kendig Co. and Coffin Valve Co., both assistants in electric and power equipment section; Alexander C. Brown, chief of the crane section, vice president and general manager of the Brown Hoisting Machinery Co., Cleveland; Albert R. Brunker, chief of the acids and heavy chemicals section, president of the Atlantic Steel Casting Co.

W. B. Bryan, expert, hardware and handtool section, general manager of the Bailey-Farrell Mfg. Co., Pittsburgh; Frank S. Chavannes, regional advisor, president and treasurer of the Chesapeake Iron Works, Baltimore;

Charles Catlett, chief of the refractories section, mineral properties examiner, Richmond, Va.; Le Roy Clark, chief, electric cable and wire section, president of the Safety Insulated Wire & Cable Co., New York City; Irwin H. Cornell, expert, nonferrous section, vice president of the St. Joe Lead Co., New York; Donald R. Cotton, regional advisor, district sales manager Illinois Steel Co., St. Paul, Minn.; Thomas G. Cranwell, assistant to chief, tin section, Continental Car Co., New York; Arthur E. Crockett, assistant chief, chain section, sales manager of the chain department, Jones & Laughlin Steel Co., Pittsburgh; Ernest D. Crockett, assistant, machine tool section, sales engineer, Henry Prentiss & Co., Springfield, Mass.; Harry M. Easton, assistant chief, tin section, general sales manager, Weirton Steel Co., Weirton, W. Va.; Alvin B. Einig, assistant chief, machine tool section, Motch & Merryweather Machinery Co., Cleveland; J. Rogers Flannery, chief, railway equipment and supply section, president Flannery Bolt Co., Pittsburgh; Charles K. Foster, vice chairman priorities committee, vice president American Radiator Co., Chicago; Martin J. Gillen, expert, finished products section, Mitchell Wagon Co., Racine, Wis.; John F. Glenn, assistant, electric and power equipment section, New England sales manager Edge Moor Iron Co., Boston; Max Greenburg, expert, electric and power equipment section, manager erecting and service department, Worthington Pump & Machinery Corp.

Charles C. Hanch, chief, automotive products section, treasurer Studebaker Corp., South Bend, Ind.; John M. Hanson, member and secretary advisory committee on plants and munitions, president Standard Steel Car Co., Pittsburgh; Maurice Hirsch, secretary priorities committee, attorney, Houston, Tex.; James W. Hitchcock, assistant to chief, tin section, general manager I. Sulzbacher Co., Steubenville, O.; Percy Holbrook, member, priorities committee, vice president Rail Joint Co., New York City; James Inglis, member, requirements division, president American Blower Co., Detroit; Lewis R. Kittredge, member, facilities division, president Peerless Motor Car Co., Cleveland; Alex Legge, vice chairman, war industries board and chairman, requirements division, vice president and general manager International Harvester Corp.; Harry L. Lewenberg, division of planning and statistics, assistant to vice president St. Louis Car Co., St. Louis; Louis F. Lippa, assistant, crane section, engineer Brown Hoisting Machinery Co., Cleveland; E. W. Lively, expert, hardware and handtool section, southern representative L. S. Starrett Co., Athol, Mass.; Ezra F. Wood, member advisory committee on plants and munitions, first vice president and consulting engineer International Nickel Co., N. Y.; Pope Yeatman, chief, nonferrous metals section, consulting engineer, New York City.

Floyd C. Lowell, assistant, machine tool section, sales engineer Henry Prentiss & Co., Buffalo; Clarence M. Lyman, expert, building materials section, manager sales and publicity International Heater Co., Utica, N. Y.; William E. McCullough, member advisory committee on plants and munitions, cost clerk Standard Steel Car Co., Butler, Pa.; George E. Merryweather, chief, machine tool section, president Motch & Merryweather Machine Co., Cleveland; Everett Morss, chief, brass section, member priorities committee, president Morss & White Co., Simplex Wire & Cable Co., Simplex Electric Heating Co., Boston; James R. Offield, expert, priorities division, president Bon Air Coal and Iron Corp., Chicago; Edward E. Parsonage, chief, agricultural implement section, secretary and manager of the John Deere Wagon Co., Moline, Ill.; George N. Peek, committee of finished products, vice president Deere & Co., Moline, Ill.; Frank E. Penick, assistant business manager, purchasing committee, auditor of sales in Russia, International Harvester Co., Chicago; Thomas M. Rees, expert, machine tool section, sales engineer Motch & Merryweather Machine Co., Cleveland.

Walter Robbins, assistant to commissioner of finished products, chief, electric and power equipment section, vice president Wagner Electric & Manufacturing Co., St. Louis; Hugh W. Sanford, chief, ferroalloys section, treasurer and general manager Sanford-Day Iron Works, Knoxville, Tenn.; John C. Schmidt, chief, chain section, president Schmidt & Ault Paper Co., York, Pa., Standard Chain Co., Pittsburgh; George N. Shaw, member advisory committee on plants and munitions, mechanical engineer Standard Steel Car Co., Butler, Pa.; Jean M. Shaw, expert, hardware and handtool section, vice president, secretary and general manager George H. Adams & Co., Hill, N. H.; Howard J. Snowden, member advisory committee on plants and munitions, draftsman Baldwin Locomotive Works, Philadelphia; Charles E. Stamp, assistant chief, crane section, president and treasurer C. E. Stamp Co., Cleveland; Lawrence J. Stoddard, expert, hardware and handtool section, sales manager, gage division, Greenfield Tap & Die Corp., Greenfield, Mass.; George C. Stone, expert, nonferrous metals section, engineer New Jersey Zinc Co., New York City.

Loland L. Summers, technical advisor, war industries board, L. L. Summers & Co., New York City; E. C. Thurston, assistant to chief, nonferrous metals section, engineer with Pope Yeatman, New York City; Chester D. Tripp, associated chief, ferroalloys section, vice president Miami Metals Co., Chicago; Upshur F. Turpin, assistant, building materials section, designing engineer Dayton-Wright Aeroplane Co., Dayton, O.; Samuel M. Vauclain, chairman, special advisory committee on plants and munitions, senior vice president Baldwin Locomotive Works, Philadelphia; John H. Waterman, expert, electric and power equipment section, engineer Allis Chalmers Manufacturing Co., Milwaukee; Stewart W. Webb, regional advisor, Boston, president Clinton Wire Cloth Co., Boston; Lawrence H. Wetherell, expert, hardware and handtool section, vice president and treasurer Wetherell Bros. Co., Boston; Frederick S. Wilhoit, assistant, electric and power equipment section, manager, printing and equipment division Cutler-Hammer Manufacturing Co., Milwaukee; John P. Wilson, assistant to chief of tin section, assistant manager National Lead Co., New York City.

Will Resell War Material Cautiously

WASHINGTON, Dec. 24.—That the war department proposes to exercise great care not to unduly disturb market conditions in disposing of the immense quantities of materials it has acquired since the United States entered war, is evidenced by the official announcement made last Wednesday regarding the manner in which this question is to be handled. In this announcement it was stated that Benedict Crowell, assistant secretary of war and director of munitions, has been requested by the President to assume responsibility for the proper disposition of all property coming into the hands of the war department since April 6, 1917. Mr. Crowell has appointed C. W. Hare, assistant director of munitions to have general supervision of this work and Brig. Gen. C. C. Jamieson has been appointed director of sales in direct charge of an organization to be perfected for the disposal of surplus property.

Policy and procedure upon which sales will be made is being formulated by the director of munitions, the assistant director of munitions and the director of sales. It is the intention of the director of munitions to so market government property as to interfere as little as possible with business conditions and to this end the assistant director of munitions and the director of sales will, as occasion may require, confer with committees representing the industries affected. Announcement is made that any information in connection with the various problems involved will be furnished by either the assistant director of munitions or the director of sales at their offices in the Munitions building, Nineteenth and B streets, Washington.

In the matter of machine tools alone, Assistant Secretary of War Crowell said that the department has $300,000,000 worth on hand. It is proposed, he said, to dispose of this by requesting the machine tool industry to include in their total sales 20 per cent of the property of the war department. While it has not been stated, it is expected that this policy will be followed with regard to other material the department now has on its hands. At the same time, it is possible that many concerns which have raw or semifinished tonnages and which was obtained for the production of war equipment, will be able, by paying a fair market value,

to take considerable tonnage from the department. Great quantities of pig iron and steel, it is understood, have been accumulated by manufacturers who had contracts with the department and which have been canceled. In connection with the so-called informal agreements alone, Maj. Gen. George W. Goethals, director of purchases, has informed the house committee on military affairs that there are 6679 such informal or verbal contracts, involving $1,675,297.75. Undoubtedly much of this represents material in either raw or semifinished form which will have to be disposed of. It will be the policy of the department, however, according to indications, to finish manufacture of many lines, such as rifles, trucks, trailers, buildings, and a certain amount of munitions, where work on them has proceeded almost to completion. By permitting these contracts to be finished, it is the view of officials of the department that the materials will be much more marketable and will yield much more money than they would if disposed of in only a partly manufactured state.

The war department already has disposed of some of the property it has acquired. Scrap steel, although in small lots, has been sold to dealers of the country, the navy department has purchased some airplanes from it, and the postoffice department, according to a provision in the postoffice appropriation bill, passed by the house last week, would get 200 airplanes from the army at a cost of $2,185,000 it is said.

Report Brings Out Price Fixing Points

WASHINGTON, Dec. 23.—In the annual report of the council of national defense, some interesting points on price fixing are brought out publicly for the first time, although some of the fundamentals involved have been communicated from time to time to the various industries over which price control has been exercised.

"In order intelligently to fix prices the committee felt that they should have (1) the history of the industry under consideration for a period of years before the war; (2) statistics of the capital invested and its relation to turnover or sale; (3) sales and profits realized; (4) the cost of production; (5) a statement or balance sheet segregating the costs of the most and least efficient producers of each commodity during the year 1917; and (6) as much more recent information regarding cost and prevailing market prices as could be had up to the time prices are to be fixed.

Aim at Stabilizing Values

"The machinery for furnishing this information was found in the federal trade commission, which immediately became closely affiliated with the price-fixing committee. After a careful study of the information thus secured the committee calls into consultation the representative members of the industry involved, and endeavors by mutual agreement to determine upon maximum prices which will be fair to all concerned. In order that no injustice may be done, the committee takes exceptional care that no final decision is reached until all data available has been collected and considered. It is the endeavor of the chairman to impress upon industries the benefits which will accrue both to the producers and to the consumers by the stabilization of values and to imbue them with the idea that the price-fixing committee represents the government of which they are a part and that their co-operation is necessary for the successful regulation of prices.

"All information, such as data supplied by the federal trade commission and by the industry, as well as all testimony taken by the official stenographer at the meetings held with the industry, has been carefully compiled, bound and filed for reference. To this data is added the results of investigations made by the chairman or other members of the committee which may be of assistance to the committee in reaching its conclusions.

"The chairman of the price-fixing committee endeavors to keep in close touch with the price-fixing policies of other nations with a view to formulating and presenting to the committee from time to time suggestions of such price-fixing policies as will best adapt themselves to the conditions in this country, and more especially with regard to trade relations with the balance of the world during the reconstruction period after the war."

Zinc Prices Dropped

Washington, Dec. 24.—At a meeting between the price-fixing committee and the representatives of the industry, it was unanimously agreed that the existing maximum prices upon grade A zinc and plate and sheet zinc should be discontinued on and after Jan. 1, 1919, the present date set for their expiration. In making this announcement, the price-fixing committee wishes to express its appreciation of the hearty co-operation of the industry in assisting the government to carry out its war program.

Substitute Catalyst Found for Platinum

Washington, Dec. 24.—What Chairman Baruch of the war industries board terms one of the remarkable inventions of the war was announced last week by the chemicals division as the finding of a substitute for platinum as a catalyst in the manufacture of sulphuric acid and chlorine.

The discovery resulted from a suggestion made by Charles H. MacDowell, head of the chemical division and president of the Armour Fertilizer Works, and was worked out by H. H. Meyers, a fellow of the Mellen Institute of Industrial Research, Pittsburgh, which since the beginning of the war has placed its entire staff and facilities at the service of the government. Edward R. Weidlein, acting head of the institute, is on the war industries board's chemical advisory staff and Col. R. F. Bacon, director of the institute, is in France with the chemical warfare branch of the American army.

Commercial production of the new catalyst is to be undertaken immediately on completion of a plant being built for the purpose. The platinum substitute is said to be as successful on a commercial scale as in laboratory tests. It is cheaper than platinum and less sensitive to poisoning, according to the board's statement. In the production of chlorine, its use is said to require only 1000 horsepower in manufacturing 100 tons, while platinum requires 20,000 horsepower to produce the same quantity.

Government Sets Woman Labor Standards

Washington, Dec. 24.—The department of labor has issued through its woman in industry service a schedule of standards recommended for the future employment of women. These provide: An 8-hour day, half holiday on Saturday, at least three-quarters of an hour for a meal, a 10-minute rest period in the morning and in the afternoon, no employment between 10 p. m. and 6 a. m., equality with men's wages based on occupation and production and not on sex, no employment in hazardous occupations, safety features and uniforms.

A preamble indicates the department's desire to have continued conditions favorable to employes which were exacted in the fulfillment of government contracts. It states: "During the war, by vote of the war labor policies board, all contracts of the federal departments contained a clause requiring full compliance with state labor laws, and in each state an official of the state labor department was deputized by the head of the contracting departments of the federal government to co-operate with federal agencies in enforcing these provisions of the contract. This affords a basis and a precedent for continued relations between state and federal agencies in the upbuilding of standards for women's labor. As the number of contracts grows fewer with the coming of peace, the responsibility of the states increases. But the recognition of the national and international importance of standards of labor conditions will still be paramount since in peace, no less than in war, the nation will depend for its prosperity upon the productive efficiency of its workers.

"No other foundation for commercial success will be so sure as the conservation of those practices in industry which make for the free and effective co-operation of the workers. Protection of the health of women workers is vital as an economic as well as a social measure of reconstruction."

The Inland Steel Co. has placed a trial installation of the Orth R regenerator in its No. 1 open hearth plant, Chicago.

Rejects Labor Decree

National Car Coupler Co., Resists Federal Board's Efforts to Force It to Bargain Collectively—93 Per Cent of Employes Satisfied

J. W. HARRISON, president of the National Car Coupler Co., Attica, Ind., has issued a public statement setting forth the company's side of its controversy with its men and reasons for its refusal to abide by a decision of the war labor board in which the board ordered the reinstatement of men discharged Aug. 12, the inauguration of the collective bargaining policy and a basic 8-hour day.

Mr. Harrison states that during the 20 years of its existence the company has been an open shop and never had a strike or serious difference with its employes. While the company was busily engaged in work for the government an organizer appeared and certain employers were set to work to unionize the shop. Their efforts were so pronounced in this direction while they were supposed to be working for the company that it was necessary to discharge 33 of them, 21 of whom later returned. With this as a nucleus a strike was ordered, but 750 employes were satisfied with their positions and the strike did not materialize. The agitators then presented the case to the war labor board, with the result that the board ruled that the company must bargain collectively with its employes.

In the meantime employes who were satisfied signed a petition waiving their rights under any award by the board and signified their desire to work under conditions as they existed. This petition was signed by 93 per cent of the company's employes and was presented to the war labor board, but the board insisted on the company putting its award into effect. In setting forth the company's reasons for refusing to abide by the award, Mr. Harrison says:

The company does not consider that the war labor board has any jurisdiction to enforce the collective bargaining policy, the United States Supreme Court having recently decided that collective bargaining must be purely voluntary by both employe and employer and cannot be enforced by either side or by any government agency. Besides, the nature of this company's work would make such a policy ruinous to its business.

This company does not object to an 8-hour day, providing it is universal, but it does object to the basic 8-hour day because it would give unfair advantage to competitors who are not compelled to use it and thereby handicap this company in retaining its present clientele and in securing new contracts.

Eight-Hour Day is Ordered for Railroad Workers

Pittsburgh, Dec. 23.—Workmen employed in the various shops of the Pennsylvania railroad have been put upon an 8-hour day basis in compliance with an order from Director General McAdoo, which also eliminates overtime and Sunday work wherever possible. Thousands of men are affected by the order and their earnings will be materially reduced, some men losing, it is estimated, as much as $100 a month. Foundrymen and roundhouse workmen are the only employes who may get overtime work hereafter. Hundreds of additional men will have to be employed under the new schedule and an early inauguration of a three-shift day is planned if sufficient labor is available. The Altoona, Pitcairn and Verona shops are rushed with work. A request to be supplied with 2248 men for the Altoona shops and along the middle division of the Pennsylvania railroad has been filed by the railroad officials with the Altoona office of the federal employment bureau.

2,000,000 Workers Placed by Employment Service

From its reorganization last January until the end of October, the United States employment service directed to employment, almost entirely in war industry, approximately 2,500,000 workers. It also increased its local employment offices from 90 to 900 in the same period, according to a report just issued by the service. The report continues:

"The steady rate at which the service has grown in extent and accomplishment is indicated by the fact that in January last 62,642 persons were sent to jobs while in October 547,862 were directed to employment. During the week ending Nov. 2, the last week but one of war conditions, 162,754 workers were directed, a rate of 650,000 a month.

Returns made by employers and workers show that approximately 2,000,000 of the 2,500,000 workers directed were placed. It is impossible to know how many of the balance were placed, owing to the failure of some employers and workers to notify the service of the acceptance of workers or jobs.

"The replacement of war workers and soldiers in peace industries already begun would indicate that the volume of work of the employment service during the coming months will be as great as it was up to the signing of the armistice."

Demand for Labor Shows General Decline

A general decline in the demand for labor since the signing of the armistice is noted by the statistical section of the United States employment service. In a number of sections of the country the decline began early in September; in others there was an increasing demand up to the middle of October, followed by a sharp decline. In the New England states the supply and demand are now said to be about equal. In New York, Pennsylvania and the central states the demand still exceeds the supply while the supply and demand on the Pacific coast are about equal.

A report compiled by the Indianapolis branch of the National Metal Trades association shows that 790 employes were recently laid off by 12 firms because of cancellations of war contracts. According to Secretary of War Baker the total amount of war contracts in Indiana cancelled up to Nov. 30 was $44,000,000, affecting about 20 firms. Cancellations in other states are said to have caused the decline in the demand for labor, although there is no evidence that any hardship has been imposed, employes released from war work finding work in civilian pursuits.

The employment service has issued an appeal to employers in need of technical and other highly trained men to take on qualified men from the commissioned and enlisted ranks of the army who are now leaving the camps. Hundreds of officers, many of the higher ranks, are asking the camp representatives and directors of the employment service for the states to assist them to obtain new employment. There also are large numbers of enlisted men qualified for professional and technical positions who are leaving the army without having positions in sight. Among the men of this high type are engineers and other technical men, executives, chemists, statisticians, purchasing agents, employment managers, and cost accountants. Employers are urged to get in touch with these men.

Keep Wages Up, Demand of California Unions

Demanding the establishment of a standard 8-hour day in all industries, a further reduction of the hours of labor if necessary to minimize unemployment in any industry and the continuance of wage standards established during the war, the California state federation of labor has formulated a definite postwar program. Employers are urged to manifest the same co-operation with labor in dealing with the problems of readjustment as prevailed during the period of the war, to avoid Bolshevism. The labor federation maintains war wage standards have not kept pace with increased costs of necessities and that long hours and overtime were responsible for increased pay. A general policy of public ownership is urged, and the retention by the federal government of railroads, express, telephone and telegraph companies is demanded. Antagonism is expressed to any relaxation of the stringent regulations of the seamen's law.

The district freight traffic committee here has on its docket a proposal to reduce the export rate on self-propelled vehicles in carload lots from Detroit to Pacific coast ports from $3.87½ to $3 per 100 pounds, a proposal to reduce the carload rate on chrome ores from California terminals and intermediates to Baltimore from 84½ to 79 cents per 100 pounds with a minimum of 80,000 pounds and a proposal that export shipments from consignor to one or more consignees at one or more destinations shall be delivered to one vessel with a charge of $2 each to be made for each separate bill of lading issued.

Men of the Iron Trade

Personal News of a Business Character Regarding the Men of Affairs of the Industry

JOSEPH H. FRANTZ, vice president and general manager of the Columbus Iron & Steel Co., Columbus, O., is on a readjustment committee with H. K. Raymond, Akron, O., and Charles King, Marion, O., appointed by the National Association of Manufacturers. Stephen C. Mason of Pittsburgh, president of that organization, presided over a recent meeting of the committee, called to consider the matter of employment for returned soldiers. All manufacturers represented are pledged to give to returned soldiers the jobs they had while in civil life. Their plans call likewise for jobs for disabled soldiers.

H. A. Wilder has been made purchasing agent for the Keppenstall Forge & Knife Co., Pittsburgh.

Leonard W. Smith, formerly in charge of the copy and planning department of the Dunlap-Ward Advertising Co., now is affiliated with the Powers-House Co., advertising engineers, Illuminating building, Cleveland.

C. W. Cook, assistant director of operations for the Emergency Fleet corporation, has returned to San Francisco from Washington. He will direct the local operation of the government's fleet of cargo carriers.

A. F. Eichman has been placed in charge of the machine tool department in the recently opened sales office and display rooms at 1930 Grand avenue, Kansas City, of the English Tool & Supply Co.

G. E. Merryweather, president of the Motch & Merryweather Machinery Co., Cleveland, who has been serving in Washington as chief of the machine tool section of the war industrise board, has returned to his regular duties with his company.

E. B. Germain, retiring general manager of the Moore plant of the Bethlehem Shipbuilding Corp., at Elizabeth, N. J., recently was honored at a dinner given at Newark. J. W. Powell, vice president of the corporation, acted as toastmaster.

Harvey H. Brown has been elected chairman of the board of directors of the Brown Hoisting Machinery Co., Cleveland. Alexander C. Brown has been made president, Melvin Pattison, vice president and general manager; E. C. Pierce has been appointed general manager of sales and Robert G. Clapp and John F. Price have been added to the board of directors.

A. E. Murray of the Platt Iron Works Co., Dayton; E. R. Kenny of the Dayton Metal Products Co., and M. G. Benson of the Peerless Paper Co., that city, were appointed as a nominating committee by the Dayton Branch of the National Association of Purchasing Agents.

Charles B. Manville, Pleasantville, N. Y., the new president of the National Sales Machine Co. and the Hobbs Mfg. Co., Worcester, Mass., gave a get-acquainted dinner to prominent men of that city, Dec. 10. Mr. Manville is the founder of the H. W. Johns-Manville Co., New York, and is over 80 years old, though still active in business.

W. F. Keckeisen has joined the staff of Russell T. Gray, advertising engineer, First National Bank building, Chicago. Mr. Keckeisen formerly was advertising manager of the International Filter Co. and previously was associated with the Federal Sign Co.

Max W. Babb, vice president and general counsel of the Allis-Chalmers Mfg. Co., Milwaukee, has been elected a director of the Chamber of Commerce of the United States to represent the district embracing Wisconsin, Illinois, Michigan and Indiana on the national council.

Arthur T. Squires, manager of the Providence, R. I., office of the Wright Wire Co., Worcester and Palmer, Mass., has been elected a trustee of the Worcester independent industrial schools, to succeed George N. Jeppson, works manager of the Norton Co. in that city.

W. C. Fletcher has resigned his position as manager of the American Steel Foundries plant at Sharon, Pa., and has been succeeded by A. Robertson, who has been Mr. Fletcher's assistant, while A. D. Allen, who has been production manager of the plant, becomes assistant to Mr. Robertson.

H. C. White, who has been actively engaged in the reorganization of the plants of the Holt Mfg. Co., at Stockton, Cal., and Peoria, Ill., during the last three years, has been appointed factory manager of the plant of the Harris Mfg. Co., Stockton, Cal., builder of harvesters.

Allen Fraser, eastern sales manager of the Wickwire Steel Co., has been placed in charge of the new office opened by the company in the Equitable building, 120 Broadway, New York City. Mr. Fraser was formerly district sales manager at the Buffalo office of the American Steel & Wire Co.

Joseph G. Butler Jr., Youngstown, O., vice president of the Brier Hill Steel Co., celebrated his seventy-eighth birthday last Saturday, Dec. 21. Congratulatory messages by telephone, telegraph and letter were received by him from his host of friends and acquaintances all over the country.

H. E. Walker, who has resigned as superintendent of the Hartford Special Machinery Co., Hartford, Conn., to accept a similar position with the Atlantic Screw Works in the same city, has been presented a check for $200 by the company and a gold watch, chain and charm by employes in appreciation of his services.

Nelson T. Burns, formerly with the New York Central railroad, has joined the sales department of the Vapor Car Heating Co., with headquarters in Chicago, succeeding Roswell P. Cooley, who has been appointed eastern sales manager to fill the vacancy caused by the resignation of George T. Cooke.

A. L. Beauchene, for six years master mechanic and general superintendent of the Atlantic Screw Works, Hartford, Conn., which positions he recently resigned, and A. E. Beauchamp, of that city, have organized the Charter Oak Machine Co. and will do a general machine shop business.

C. C. Chapel, formerly affiliated with the Hercules Gas Engine Co., Evansville, Ind., and subsequently associated with the Waterloo Gas Engine Co., Waterloo, Iowa, has been appointed superintendent of the foundry that is being erected by the Montgomery, Ward Co. at Springfield, Ill.

Gordon I. Lindsay has been elected president of the Robeson Process Co., New York, manufacturer of liquid core binders. He also has been elected president of the American Gum Products Co., of the same city. For several years Mr. Lindsay has been general manager of the American Gum Products Co.

John A. Savage, president of the Hamilton Furnace Co., Hamilton, O., who has been a major in the engineer branch of the United States army at Washington, returned to Hamilton last week to view the recent improvements made by his company. It is expected that the new ore dump will be completed by Jan. 1.

Walter B. Douglass, president of the New England Structural Co., Boston, and Martin B. McLauthlin, treasurer of the George T. McLauthlin Co., Boston, maker of machinery, have been elected president and first vice president, respectively, of the Employers' Association of Eastern Massachusetts.

Samuel Moore has been appointed general superintendent of the Whiting Foundry Equipment Co., Harvey, Ill., to succeed F. A. Rundle. Mr. Moore formerly was general manager of the Bond plant of the American Radiator Co., Buffalo. C. A. Hardy has resigned as sales manager; George Ristine, formerly affiliated with the Pressed Steel Car Co., Pittsburgh, and H. A. Wolcott, formerly with the McMyler Interstate Co., Cleveland, and E. V. Brown, and Walter R. Hans, members of the company's engineering staff, will be the Chicago representatives of the Whiting Co., succeeding G. R. Brandon and P. A. Dratz.

Iron and Steel Financial News

Up-to-the-Minute Fact and Comment Collected and Sifted For Busy Readers

Genuine Market Values Yet to be Fixed

STAGNATION, incidental to a readjustment of prices and demand, is evident in general business, so far as new buying is concerned and is reflected in the stock markets. Removal of government restrictions on prices and consumption has caused speculators and investors to wonder how large an amount of finished and raw materials remain to be distributed under competitive prices, and to what extent selling competition may prevail after the year end. It is now established that government control ceases Jan. 1. Industry is well along in the transition period. Until the course of the commodity markets is more definitely established, consumers appear likely to hold back excepting for pressing requirements, while the stock market similarly will suspend judgment.

It has often been said that industry has been diverted from its normal channels. The comparison might be carried a bit further. In normal times the stream flows peacefully, sometimes high and sometimes low, according to the season, nourishing the crops along its banks and the livestock in the fields drink of it. Then the farmer may decide to grind his wheat, so he builds a dam and uses the water for power for his mill. Later, the wheat is ground and he decides to abandon the mill. He might dynamite the dam and in the course of time the stream would find its natural channel. But meanwhile, it would have overrun its banks and destroyed the crops in its vicinity. So he pipes an outlet and lets the water out gradually.

In the same way, the government control of industry has constituted a dam, the output of industry being diverted to furnish war power. The war is won and the dam is no longer needed. The crops along the stream are the commercial industries from which the water has been withheld. The sudden withdrawal of control is equivalent to dynamiting the dam. The long parched crops would be flooded, for they will have available more supplies than they need and to their own detriment.

But here is where the simile ends. The government plays the role of farmer and it has decided to let the dam go Jan. 1. In a general way, leaders in some industries have tried to ease the transition by reducing prices moderately, probably hoping that consumers would take up output on the declining scale of prices. But such efforts will not stem the tide, for without government co-operation no human power can effect an arbitrary readjustment.

The foregoing is one view with respect to business prospects. But it would be possible to obtain any view one likes from leaders in business in finance. He ventures on dangerous ground who attempts any prediction in these uncertain times. However, the iron and steel industry may find some parallel in the lead trade. In the months prior to the end of hostilities, lead was scarce and the less essential industries were drastically rationed or entirely deprived of the metal. Distribution and prices were controlled by a committee of producers having government sanction. After the armistice was signed, cancellations began to appear. On Dec. 2, the committee reduced prices 1 cent, from 8.05c per pound, New York, to 7.05c. But buying was not stimulated. On Dec. 20, the committee decided to drop all restrictions, both on prices and resales. On Dec. 21 the new ruling became effective and that day producers, freed from restraint offered lead all the way down to 6.00c, New York, without attracting a buyer. Some of them expressed the opinion that they could almost offer to give the lead away, without interesting buyers. Eventually of course, a market will be established. And the level at which this market is established will determine the extent to which production will be curtailed. Some of the high cost producers suspended operations when the market went below 8.00c. Something of the same situation may confront the steel, copper and other industries Jan. 2.

Will Erect Larger Plant

Plans of the recently incorporated Watson-Fry Co., Ltd., Bath, Me., have been changed. Instead of a new plant on the old site occupied by the former Watson, Frye & Co., a much larger site has been purchased. Building operations now contemplated comprise a manufacturing plant containing a bronze foundry, machine shop, pattern shop, metal-working shop and marine repair shop. Work will commence upon these as soon as present tenants can be removed from the buildings and the old buildings removed. Capital stock is $200,000.

72,779 Now Hold Common Stock in U. S. Steel

The number of holders of common stock of the United States Steel Corp. has nearly doubled in two years, the present number being listed officially as 72,779. The previous high record was attained three months ago, when the number reached 65,862. It was 51,689 a year ago and 37,720 in December, 1916. Brokers held 2,230,284 shares of the stock, or 43.88 per cent, on Sept. 30, as compared with 2,950,436 shares or 58.04 per cent Dec. 31, 1916. Investors' holdings last September were 2,852,740 shares, or 56.12 per cent of the issue, while in December, 1916, their holdings were 2,132,589 shares or 41.96 per cent of the issue. The figures indicate the growing popularity of the issue among the rank and file of individual investors.

The number of holders of Steel preferred was 80,120 in November as compared with 80,065 in August and 80,142 in May.

Make Reinforced Roofing

A modernly equipped plant for the manufacture of reinforced cement roofing is being erected at New Castle, Pa., by the United States Cement Tile Co., which was recently incorporated with $100,000 capital. Matthew Gunton is president of the company and the other officers are: E. F. Norris, secretary; G. R. Mueller, general manager, and W. H. Ault, superintendent. These men all have had wide experience in the manufacture of cement tile, Mr. Gunton was one of the organizers of the American Cement Tile Co., Pittsburgh. The purpose of the company is to manufacture several types of reinforced cement roofing tile of improved design. The plant which is now being built is expected to be ready for occupation within a short time. The general offices of the company are at 706 Lawrence Savings & Trust building, New Castle, Pa.

Metallurgists Will Form New Society

The formation of a metallurgical society exclusively confined to the branches dealing with steel, iron and their alloys, was decided upon recently at a meeting of a number of prominent metallurgists at Pittsburgh. The aim of the society, will be the promotion of the arts and sciences connected with the metallurgy if iron, steel and their alloys. A committee to complete the plans formed at this meeting was appointed, and D. L. Mathias of Mackintosh, Hemphill & Co., Pittsburgh, was selected as chairman. The necessary data and steps to materialize the society are now being prepared by this committee. At present the number interested in such a society is very small, and before it can be a real force, the co-operation of those eligible for membership is needed.

By-Products Market

Is Quiet With Only Benzol and Naphtha in Good Demand

New York, Dec. 21.—Demand for sulphate of ammonia is abnormally quiet due in a large measure to the fact that consumers are well supplied with other forms of ammonia. This condition results from the scarcity of sulphate during the war, which caused them to lay in supplies of substitutes. As a result, prices show an easy tendency. Occasional sales of spot sulphate are being made at $4.75 to $5 per 100 pounds at producers' plants. Interest in contracts is confined to the near future. There have been a few small contract sales for delivery over the next three months at $4.75 per 100 pounds at producers' plants. Occasional export inquiries are coming out, but prospective buyers are in no hurry to close as they are hoping for lower prices.

Coke Oven By-Products

Spot

Per Gallon at Producers Plant	
Pure benzol	$0.22 to .27
Toluol	.25 to .30
Solvent naphtha	0.20 to .25
Per Pound at Producers Plants	
Phenol	nominal
Naphthalin, flake	.10
Naphthalin, balls	.12½
Per 100 Pounds at Producers' Plants	
Sulphate of ammonia	$4.75 to 5.00
Contract	
Pure benzol	$0.22 to .27
Toluol	.25 to .35
Solvent naphtha	.20 to .25
Per Pound at Producers Plant	
Phenol	nominal
Naphthalin, balls	.12½
Naphthalin, flake	.10
Per 100 Pounds Producers' Plants	
Sulphate of ammonia	$4.75

The market in phenol practically has disappeared for the time being. There is no demand for this product and owing to the wide range of quotations of late it is impossible to determine the market value of this product. None of the export inquiries which were put out in the market during recent weeks have resulted in business.

Demand for benzol is fairly good. This product at present is being sold mostly for use as motor fuel. It continues to bring 22 to 27 cents per gallon at producers' plants. In toluol the demand is small but regular and prices continue to range from 25 to 35 cents per gallon. The solvent naphtha market is the strongest among the coal tar products, due in large measure to the fact that production is limited. Solvent naphtha continues to be quoted at 20 to 25 cents per gallon. Business in naphthalin continues to be done slowly with prices at 12½ cents per pound for balls and 10 cents for flake naphthalin.

New York, Dec. 21.—Following a lapse in activity for several months, a meeting of reorganization was held here last week by the By-product Coke Producers' Association of America. W. H. Ball of the Semet-Solvay Co., Syracuse, N. Y., was elected president. James A. Galligan of Pickands, Brown & Co., Chicago, was elected vice president in charge of the middle western division, and Nils Anderson of the Debevoise-Anderson Co., New York, was elected vice president in charge of the eastern division. Separate, periodic, divisional meetings will be held regularly, alternating occasionally with meetings of the entire membership.

Obituaries

JOHN STERLING DEANS, vice president of the Phoenix Bridge Co., and one of the founders of the Bridge Builders and Structural Society, died Dec. 15 at his home in Phoenixville, Pa., aged 60 years. He was the designer of the original steel bridge across the St. Lawrence river at Quebec, which fell in 1907 just before completion. Mr. Deans was a member of the Engineering Club, New York City, and the American Society of Civil Engineers. His death came after a long illness.

Leader Seth Woodbury, president and founder of the Great Falls Iron Works, Great Falls, Mont., died Nov. 22.

George J. Hotz, aged 35, president and manager of the Hotz Bros. Foundry Co., Fremont, O., died at his home in that city Dec. 13, from influenza.

Henry Grant Tuttle, for 19 years connected with Lockwood, Greene & Co., Boston, and recently appointed manager of its engineering department, died at his home in Arlington, Mass., Dec. 16, aged 37 years.

Capt. Harry W. Ford, president of the Saxon Motor Car Corp., Detroit, died of pneumonia, Dec. 18, in a New York hospital within a few days of his discharge from the motor transport service of the army.

G. James Gustafson, sales manager for the Torrington Mfg. Co., Torrington, Conn., died in Boston, Dec. 6, of pneumonia, aged 32 years. In January, 1917, he was selected general manager of the company's branch factory in Aachen, or Aix la Chapelle, Germany, but never reached his post.

Karl A. Funk, structural engineer, who had been in charge of manufacturing devices for the government for airplanes by which the operator could telephone to the ground, at plant of the Deslauries Aircraft Corp., Newark, N. J., the past year, died in Brookline, Mass., Dec. 10, of pneumonia, aged 28 years.

Homer O. Page, son of the founder of the Page Woven Wire Fence Co., now the Page Steel & Wire Co., Monessen, Pa., and Adrian, Mich., a director of the company and manager of its specialty department, died at his home in Adrian, Dec. 7. Mr. Page, who was about 35 years old, was born and lived all his life in Adrian.

Joseph W. Henderson, chief of the Pittsburgh bureau of smoke regulation of the department of health and who for several years was connected as a chemical engineer with the steel industry, died at St. Francis hospital, Pittsburgh, Dec. 19, of pneumonia. Mr. Henderson was born in Canada in 1868. When a young man he went to Chicago where he entered the employ of a foundry company. Subsequently he became identified with the Griffin Car Wheel Co., Chicago, as a chemist. In 1899, he became superintendent of the Maryland Car Wheel Co., Baltimore, remaining with the company until 1904, when he took a position with the Pressed Steel Car Co., Pittsburgh. Later he went with the Standard Steel Car Co., and later still, he organized the Butler Car Wheel Co. In 1907, he and J. A. Gulick of New York, founded the Gulick-Henderson Co., engineers. In 1917, he was appointed chief of the smoke bureau of Pittsburgh. Mr. Henderson was a member of the American Society of Mechanical Engineers, the American Society of Mining Engineers and several Pittsburgh organizations.

J. King McLanahan, who died at his home in Hollidaysburg, Pa., at the age of 90, was one of the pioneers in the iron industry in the Pittsburgh district. His first business activity was as a clerk in the office of Dr. Peter Schoenberger, of Pittsburgh, one of the early ironmakers and at the time of Mr. McLanahan's entering his employ, owner of the Sarah blast furnace at Hollidaysburg, Pa. Mr. McLanahan later entered the Baldwin Locomotive Works as an apprentice. Late in the 40's he organized a foundry in Hollidaysburg in partnership with Michael Kelly, which he later left to become superintendent of the Shock Steam Fire Engine Works at Cincinnati. The first steam fire engine manufactured in Ohio was designed by Mr. McLanahan. In 1885 he returned to Hollidaysburg and became a member of the firm of Watson, White & Co., making the designs and superintending the erection of a blast furnace for this concern. He remained with this firm until it was absorbed by the Cambria Iron Co. Later he became active in the limestone development in central Pennsylvania with Daniel J. Morrell and John Fritz. In the spring of 1857 Mr. McLanahan admitted William Stone to partnership in the foundry, as successor to Michael Kelly. This association has since continued, now being designated as the McLanahan-Stone Machine Co. Mr. McLanahan also was at various times interested in the Rodman furnace and the Bloomfield ore deposits, the Blair Iron Co., Juniata Iron Co., and the American Lime & Stone Co. He also organized the firm of McLanahan, Smith & Co., which operated a rolling mill.

Year's End Sees Quiet Tool Market

Inventory Time, Expectations of Lower Prices and Contract Adjustments Contribute to Inactive Conditions—Improvement Looked for Next Month—Neville Island Project Revived—Builders to Sell Government-Owned Equipment

AS is usual at the end of the year, little activity prevails in the machine tool market. Inquiries are few and orders are scattered. A number of causes contribute to this condition, among them being the taking of inventories; an expectation on the part of users that prices will come down and an inclination to await final adjustments on contract cancellations. In connection with prices, dealers do not expect any immediate revisions downward, although one manufacturer of presses has notified New York dealers that his prices are reduced 10 per cent. In contrast to this, increases are noted by Cleveland dealers in one line of milling machines and one on planers. Chicago reports no changes in prices other than an absence of the increases which were so frequent several weeks ago.

Interest in the Neville island ordnance plant is renewed in Pittsburgh. It now appears that the Steel corporation is not to operate it and the government will complete the project with the probability that equipment requirements will be revised. No undue optimism prevails regarding the early placing of orders for tools, since a number of cancellations have to be adjusted. Another item of interest in that territory is the offer of a large lot of used machines by the Westinghouse Electric & Mfg. Co. Other machines are offered from plants which have been engaged on munition and gun contracts.

It would seem that the plan gradually taking form to have the government-owned equipment gradually absorbed by builders selling it in certain relative proportions to sales of their new machines will cause no great disturbance. One Cleveland dealer reports that the factories with which he is in touch will not accept cancellations on standard types. When the machines are special or single purpose, and the user cannot operate them, he invoices the tools, receives payment and then disposes of them for his customer at a charge of 10 per cent.

Inquiries coming to Cleveland dealers have been more numerous this last week and the previous one than for some time past. This is taken to mean that shortly after the first of the year a buying movement will set in. Similar expectations are held in other districts, although there is a feeling that no real spurt can be expected for 60 days or until later in the spring. One prominent midwestern dealer shares the feeling of some manufacturers that after an improvement in the market a period of depression can be expected about July 1. Many buyers are holding off until after their policies for 1919 have been decided upon, some are not yet sure as to what they will take up as a substitute for war work not being inclined to return to their prewar products.

A revival of building projects delayed by the war is noted in some directions. This is particularly true in the east. A $500,000 expenditure is to be made by the Marine Engineering & Dry Dock Co., Providence, R. I., for a boiler plant and machine shop. A large addition to the plant of the Standard Underground Cable Co., Perth Amboy, N. J., where copper tubing will be manufactured, presages tool needs.

Demand for cranes continues quiet, with few inquiries. Sales are likewise few. The Pennsylvania railroad has not acted on its list of cranes for various shops, but is asking for several additional 5-ton locomotive cranes.

Holiday Season Acts as Deterrent on Tool Buying

WITH the holiday season at hand, the dullness prevailing in the eastern machine tool market is most pronounced. A few scattered orders continue to be where such equipment is immediately needed for rounding out equipment, but the total volume of this buying is relatively small. Such a situation, however, is being taken as a matter of course and attention generally is being centered upon the future, when inventories will be past and conditions, as a whole, have had more time to adjust themselves. In the meantime, the adjustment of cancelled contracts is going ahead and plans are in the process of making for the disposition of government-owned equipment. A definite policy in this latter regard is expected to be announced shortly.

Machine tool builders have noted with satisfaction the favorable report made recently by the house military committee on the bill legalizing informal contracts of the war department. Approximately 7000 contracts, given verbally or by telegraph, aggregating $1,675,000,000, will be affected by the measure. Prices as a whole remain steady in the east, although one manufacturer of presses has reduced his prices 10 per cent. However, no marked decline of a general character in prices is expected to materialize as long as the present high cost of labor continues, and high priced raw materials remain on hand.

Among new projects now being planned in the east, is the erection of a $500,000 repair plant by the Marine Engineering & Dry Dock Co., Providence, R. I. The project calls for the erection of a large boiler plant and machine shop. Another project of note is the proposed $50,000 addition to the plant of the Standard Underground Cable Co., Perth Amboy, N. J. The new extension will be used for the manufacture of copper tubing. The Crane Co., Syracuse, N. Y., will be in the market shortly for some special equipment for the needed manufacture of metal products. The American Machinery & Foundry Co., Brooklyn, has purchased three buildings adjoining its plant, for which some new equipment will be required. The American Engineering Co. has recently awarded the contract for a $40,000 plant addition.

Demand for cranes continues quiet, there being but few inquiries and virtually no sales. The Pennsylvania railroad is understood to have issued an inquiry for several 5-ton locomotive cranes. As yet, no action has been taken by the Pennsylvania on its list of electric cranes, which has been increased from time to time during the past two months. Included in the few new inquiries of the past week is a 10-ton crane for the Mansfield Foundry Co., Mansfield, Mass., and a 20-ton gantry crane for the Baltimore & Ohio railroad. This latter inquiry is issued

AGATHON

Alloy STEELS

Torsional stress is at its worst when these powerful trucks tackle the battle terrain, but Agathon Steel is equal to it.

THE CENTRAL STEEL CO.
MASSILLON, OHIO

Branch Offices

Chicago Office—1370 People's Gas Bldg., 122 So. Michigan Blvd., C. H. Beach, District Sales Mgr.

Cleveland Office—Hickox Bldg., The Hamill-Hickox Company, District Reps.

Detroit Office — 326-27-28 Ford Bldg., F. Walter Guibert, District Rep.

Philadelphia Office—603 Widener Bldg., Frank Wallace, District Sales Mgr.

Syracuse Office—621 University Block, T. B. Davies District Sales Mgr.

Export Dept.—20 Broad St., New York.

AGATHON STEELS

through the Baltimore office. The McClintic-Marshall Co., Pittsburgh, recently issued an inquiry for one 20-ton and three 10-ton overhead cranes for shipment to Baltimore.

Chicago Demand is Stationary

AS is usually true in the holiday season, when taking of inventory acts as a damper on activity, buying of machine tools in the Chicago district is comparatively light. There is some inquiry and some buying, but demand is fairly stationary and no decided increase in business is expected until the middle or the last of January when activities for the year have been definitely outlined and acted upon. No changes have been made in prices, but the advances which were a regular thing for several months past apparently have ceased. Disposition of the government's large accumulation of completed machine tools under a plan now being perfected by which manufacturers will sell the government's machinery in certain relative proportions to their own new product, promises to absorb this excess without causing great disturbance.

No Change in Cleveland District

SIMILAR conditions exist in the Cleveland machine tool market to those which have prevailed for the past few weeks. No real change is anticipated for 60 days in some quarters and in others no improvement is looked for before late spring. On the other hand a bettered market is expected by one prominent dealer from now on until July when, he says, will come a period of depression. A great deal of shopping around prevails. It is thought that many users hesitate to buy having keen expectations of lower prices. While some dealers are persuaded that lower prices are inevitable, others point to a raise of 5 per cent on plain milling machines received this week and an increase in the price of a certain planer filed last week. Warehouses are being visited by prospective users, who leave without placing orders, satisfied with the equipment and able to obtain immediate delivery yet apparently expectant that now that the war is over, they ought to be able to buy at their own price.

Inquiries continue plentiful, a great many lathes being asked for. Boring mills and planers are likewise in demand. The Sandusky Cement Co., through its Cleveland office, is looking for an 18 to 24-inch gap lathe. The Joseph L. Skeldon Engineering Co., Toledo, O., is installing new machine tools in a machinery repair department and requests prices on a 30-inch engine lathe, a 16-inch engine lathe, a 30 to 36-inch planer, a universal miller, a 30-inch drill press, and sensitive drill press. Used machinery will be bought if in good condition. Discriminating buyers are examining carefully each second hand machine they purchase, since many of these are said to be fit only for the scrap heap, produced quickly as they were to supply an immediate and pressing demand. Even in connection with those tools which have a national reputation, now reaching the market as second hand a complete history is asked, since many have been operated by second and even third rate workmen and are out of alignment and have had things done to them by inexperienced operators which have made them useless for the accurate work which is demanded by purchasers.

Railroads have not issued any lists and a great many have postponed their purchases until after it is definitely settled whether or not they remain under federal control.

Cancellations continue to drift in. One Cleveland user made an effort to cancel its order for equipment to be used on war work. The factory refused to cancel the dealer's order since while of a standard type, it has several special features which made it practically a single purpose machine. This is but one of many cases for readjustment and settlement. The Hercules Motor Co., Canton, O., continues to make efforts to have its cancellations accepted. Many tools were ordered several weeks ago for working on class B trucks. Some builders, while flatly refused cancellations on standard types, have worked out the problem in connection with single purpose or special machines in an amicable way. They complete the tools, bill them to the contractor, receive payment, keeping the machines on their hands. They then make every effort to dispose of them at the highest possible price and charge 10 per cent for the service.

Rumors continue to fill the air with reference to Henry Ford tractor plants. It has not been possible to learn of any lists of equipment issued for the proposed plants near Toledo and Cincinnati, the sites which were to be occupied by the government's nitrate plants. The J. B. Walsh Machinery Co., Milwaukee, is in the market for a number of lathes ranging in swing from 24 to 48-inch with 30-foot bed or longer; one 60-inch x 60-inch x 28-foot planer with two or more heads; one 5-foot universal radial drill; one slotter with 18-inch stroke; one double head 1½-inch bolt cutter and a 6-foot boring mill. C. P. Perin and S. M. Marshall, consulting engineers, New York, are asking for prices on a 1¼-inch bolt upsetting machine and a 2-inch hexagon nut-making machine for shipment to Calcutta, India.

Pittsburgh Expects New Ordnance Plant Lists

ANNOUNCEMENT that the government proposes to go ahead with the Neville island ordnance plant is pleasing to the Pittsburgh machinery and tool trade, but causes no undue optimism with regard to the early placing of equipment orders. Not only does the government propose to go slowly in the matter of constructing the plant, but it is considered likely that it will start with a clean slate in the matter of machines and tools, and a revision of original plans also is probable. Placing of business also is expected to be held up until old contracts have been adjusted and it is known how much of the original appropriation is available. The understanding here is that the United States Steel Corp. will have no part in the work when it is resumed. Outside of the announcement about the Neville island plant, little of interest has developed in the trade. Cancellations have practically ceased, but on the other hand, there have been few new inquiries, even from the railroads. The Westinghouse Electric & Mfg. Co. is offering a rather big line of used machinery and tools and Pittsburgh dealers are advertising extensive lists from plants which recently were working on munitions and gun orders. Inquiries are expected to be in force after the first of the year.

New Construction and Equipment

Concise and Timely Business Building Opportunities from the Field of Industry

Along the Middle Atlantic Seaboard

BUFFALO.—The Allen-Fleming Machine Works has been incorporated with $8000 capital by R. J. Fleming and W. H. Allen.

NEW YORK.—The Terminal Machine Co. recently was incorporated with $30,000 capital by J. L. Litton, H. I. Segal and S. Hirschberg, 406 Broome street.

NEW YORK.—Tip-it, Inc., has been incorporated with $50,000 capital to manufacture high-speed tools and welding compounds, by H. S. Dunham, J. C. Schmidt and R. L. Johnson, 366 Wadsworth avenue.

BUTLER, PA.—The machine shop of the J. T. & A. Hamilton Co. recently was badly damaged by fire. The loss was estimated at $100,000.

FRANKLIN, PA.—The Franklin Quality Refining Co. recently incorporated with $100,000 capital, plans

OHIO STEEL CASTINGS

Quality PLUS Service

The whirring of the airplane—the roaring of the fast express—the thundering chug of the rapidly approaching motor truck, all *proclaim the victory of Ohio Steel Castings over "Power"* by proving the ability of these castings to withstand the terrific, racking, straining shocks of the mightiest engines constructed by man.

If you are in need of Tractor, Motor Truck, Automobile or other small castings—castings of a quality and strength fit for the most strenuous service specify *Ohio Steel Castings.*

Let us figure on your requirements.

The Ohio Steel Foundry Co.

Plants

Springfield, Ohio Lima, Ohio Bucyrus, Ohio

the erection of an oil refinery at a cost of $45,000. Later the plant will be greatly enlarged.

PHILADELHPIA.—The Philadelphia Steel & Iron Co., Commercial Trust building, has had plans prepared for the erection of a 1-story, 40 x 90 foot shop.

PITTSBURGH.—The Union Steel Casting Co. has a permit to erect a crane runway.

PITTSBURGH.—A permit has been granted the Carbon Steel Co. to erect an additional mill building.

PITTSBURGH.—The Jones & Laughlin Steel Co., Hazelwood, Pa., recently obtained a permit to erect primary and secondary crusher buildings, to cost approximately $40,000.

READING, PA.—The Carpenter Steel Co. has awarded a contract to the Heard Construction Co. for a power plant.

SHARON, PA.—The plant of the Pennsylvania Tank Car Co., suffered a loss estimated at $150,000 as the result of a recent fire.

WILKES BARRE, PA.—Plans have been drawn for the erection of a shop addition to cost about $60,000, for the International Fabricating Corp. Bids will soon be taken. The building will be 2-story, 51 x 160 feet and will be erected at Forty Fort, Pa.

WINDBER, PA.—Application has been made to the governor for a charter for the Windber Silica Sand Co., for the purpose of producing silica sand, etc.

AMPERE, N. J.—The Crocker-Wheeler Co. recently filed plans for an addition. The company manufactures electrical machinery.

CAMDEN, N. J.—The Goff National Mfg. Co. recently was incorporated with $2000 capital to manufacture and deal in machinery, by Ralph L. Goff, Ocean City, N. J., and David H. Goff, Camden.

JERSEY CITY, N. J.—Streichert Radiator Co. has been incorporated with $100,000 capital to manufacture automobile and tractor radiators. Grover D. Carey and William D. Sewell, of Jersey City, are the incorporators.

MORRISTOWN, N. J.—The New Jersey Graphite Co. has bought a site for a plant addition.

NEWARK, N. J.—The Electrical Appliance Mfg. Co. will make alterations to its plant.

NEWARK, N. J.—Union Smelting Co. will erect a 1-story brick factory, 24 x 25 feet.

NEWARK, N. J.—Leonard Lorentowicz, 292 Halsey street, has let a contract for the erection of a welding shop, 1-story, 40 x 70 feet.

NEWARK, N. J.—Krateuter & Co., Inc., manufacturers of drop and pressed forgings, is planning a 300-foot extension to its plant.

NEWARK, N. J.—The Standard Non-skid Chain Co. has been incorporated with $25,000 capital by V. A. Wurster, Orange, and Francis J. Chaub, of Belleville.

NEWARK, N. J.—The board of education has authorized plans for the erection of an industrial school, 3-stories, 170 x 225 feet, and will be provided with a machine shop, foundry and other metal working departments.

POMPTON LAKES, N. J.—The detonator assembling building of the Du Pont Cap Works, recently was badly damaged by an explosion.

TRENTON, N. J.—The Westinghouse Lamp Co. will build a big addition to its plant here.

DOVER, DEL.—Empire Ship Drydock Corp. has been chartered with $1,500,000 capital by C. L. Rimlinger, M. M. Clancy and P. B. Drew, of Wilmington.

ELKTON, MD.—The large plant of the Scott Fertilizer Co. recently was damaged by fire. The acid plant, owned by the company was also badly damaged. The loss has been estimated at $250,000.

BALTIMORE.—The Baltimore & Ohio railroad has let a contract to the MacIvor Construction Co. for a coal loading plant and siding.

BALTIMORE.—A machine and automobile repair shop will be built by the Magneto & Machine Co., 1035 Cathedral street.

HAGERSTOWN, MD.—The Pangborn Co., Maryland Park, is building a 2-story, 40 x 70-foot addition to its plant for the manufacture of sand blast apparatus.

HAGERSTOWN, MD.—A repair shop, one story, 100 x 130 feet, will be erected here by the Western Maryland railroad.

HANCOCK, MD.—The Hancock Foundry Co., incorporated with $25,000 capital, has acquired a foundry and plans to enlarge it.

MT. WASHINGTON, MD.—The Maryland Bolt & Forge Co., Continental building, Baltimore, will install new equipment.

SPARROWS POINT, MD.—The Bethlehem Steel Co. is adding large additions to its shipbuilding plant here.

PORTSMOUTH, VA.—W. F. Dunn, marine railway equipment, contemplates the erection of a machine shop, 57 x 101 feet.

PORTSMOUTH, VA.—The Southern Brass Works awarded a contract to John W. Hoffler, 504 Fifth street, for the erection of a 1-story addition, 40 x 67 feet.

WASHINGTON.—The bureau of yards and docks is asking for bids until Dec. 30, under specification 3681, for installing at the Washington navy yard, two 20-ton electric traveling cranes, estimated to cost $28,000.

MT. HOPE, W. VA.—Plans are being drawn for the New River Coal Co. for the erection of a warehouse and machine shop.

Central States Activities

MASON, WIS.—Hegstrom Bros. are building an addition to their public garage to provide space for a complete commercial machine shop.

MILWAUKEE.—The Standard Steel Corp., Edward J. De Guenther, president, 908 Majestic building, is having plans prepared for a 2-story plant, 60 x 200 feet.

MILWAUKEE.—The Storage Battery Service Co., 137 Oneida street, will erect a new shop, 60 x 127 feet, on Jefferson street.

NEENAH, WIS.—The Myhre Machine Co. has disposed of its plant to the Hewitt Machine Co. and the two works are being consolidated. The Hewitt Co. recently purchased the Jamison water power plant and will make improvements to it.

OSHKOSH, WIS.—The common council has adopted a resolution providing for an issue of $50,000 waterworks improvement bonds.

RACINE, WIS.—A new plant will be erected in the spring by the Perfex Radiator Co.

RACINE, WIS.—The Simms Foundry Co., Racine, Wis., has awarded contracts for the erection of a shop addition, 60 x 85 feet, of steel, concrete and brick construction, designed by Architects Edmund B. Funston & Co., Racine. The steel work has been let to the Worden-Allen Co., Milwaukee, and other construction to Nelson & Co., Racine.

SUPERIOR, WIS.—The Benson Electric Co. contemplates the erection of an addition.

SUPERIOR, WIS.—G. W. Nelson, who formerly operated a brass foundry, has established a foundry in the old works of the Acme Brass Foundry Co.

TWO RIVERS, WIS.—The Aluminum Goods Mfg. Co., Manitowoc, Wis., operating large branch works here and Newark, N. J., has purchased a site adjoining its Two Rivers plant to provide for future extensions. No new construction work will be undertaken for some time, however. George Vits is president.

WATERTOWN, WIS.—Schmidt & Albrecht contemplate the erection of a machine shop.

WAUPUN, WIS.—The 1919 Wisconsin legislature will be asked by the American Society of Equity to appropriate $100,000 for the establishment of a plant for the manufacture of farm machinery at the state prison.

WEST ALLIS, WIS.—The Mennigen & Karth Machinery, expects to start work about March 1, on the erection of a 1-story machine shop extension, 60 x 80 feet, and will purchase machinery for the manufacture of hardware specialties.

CALUMET, MICH.—The plant of the Hodge Iron Works recently was purchased by the Portage Lake Foundry & Machinery Co. and will be remodeled and improved for an addition.

DETROIT.—Smith Carburetor Co. will let a contract for the erection of an addition.

DETROIT.—The Detroit Piston Ring Co., Richmond avenue, is building a new gray iron foundry.

DETROIT.—The General Screw Products Co., capitalized at $20,000, has been chartered by Gustav J. Maertens, Stanley Imerman, and Floyd Y. Harr.

DETROIT.—The Perfection Gauge Co., capitalized at

Business Changes

THE firm name of the Brown Specialty Machinery Co., Chicago, manufacturer of sand blast equipment, core machines and sand shakers, has been changed to that of the Rich Foundry Equipment Co. The Brown Specialty Machinery Co. was incorporated in 1901 by Edwin F. Brown, and was purchased by Elmer A. Rich Jr., in 1912. Since that time this company has engaged exclusively in the manufacture of foundry equipment, such as core machines, sand shakers, sand blast equipment and malleable annealing room charging trucks.

* * *

The Union Iron Works, Los Angeles, has removed the contracting and engineering departments of its business from the office in the Stimson building to the main manufacturing works at 5125 Santa Fe avenue.

* * *

The John McNab Machinery Co., Jersey City, N. J., has changed its name to the Industrial Machinery Corp. It is located at 99 Hoboken avenue.

* * *

The Spokane, Wash., branch office of the Minneapolis Steel & Machinery Co. has been removed to 114-116 South Monroe street.

* * *

The R. H. Beaumont Co., Inc., Philadelphia, conveying and hoisting equipment, recently opened its new building at 315 Arch street.

* * *

Joseph T. Ryerson & Son, steel warehouse, Chicago, have opened an office in the Widener building, Philadelphia.

* * *

The Wickwire Steel Co., Buffalo, is opening a New York office in the Equitable building at 120 Broadway.

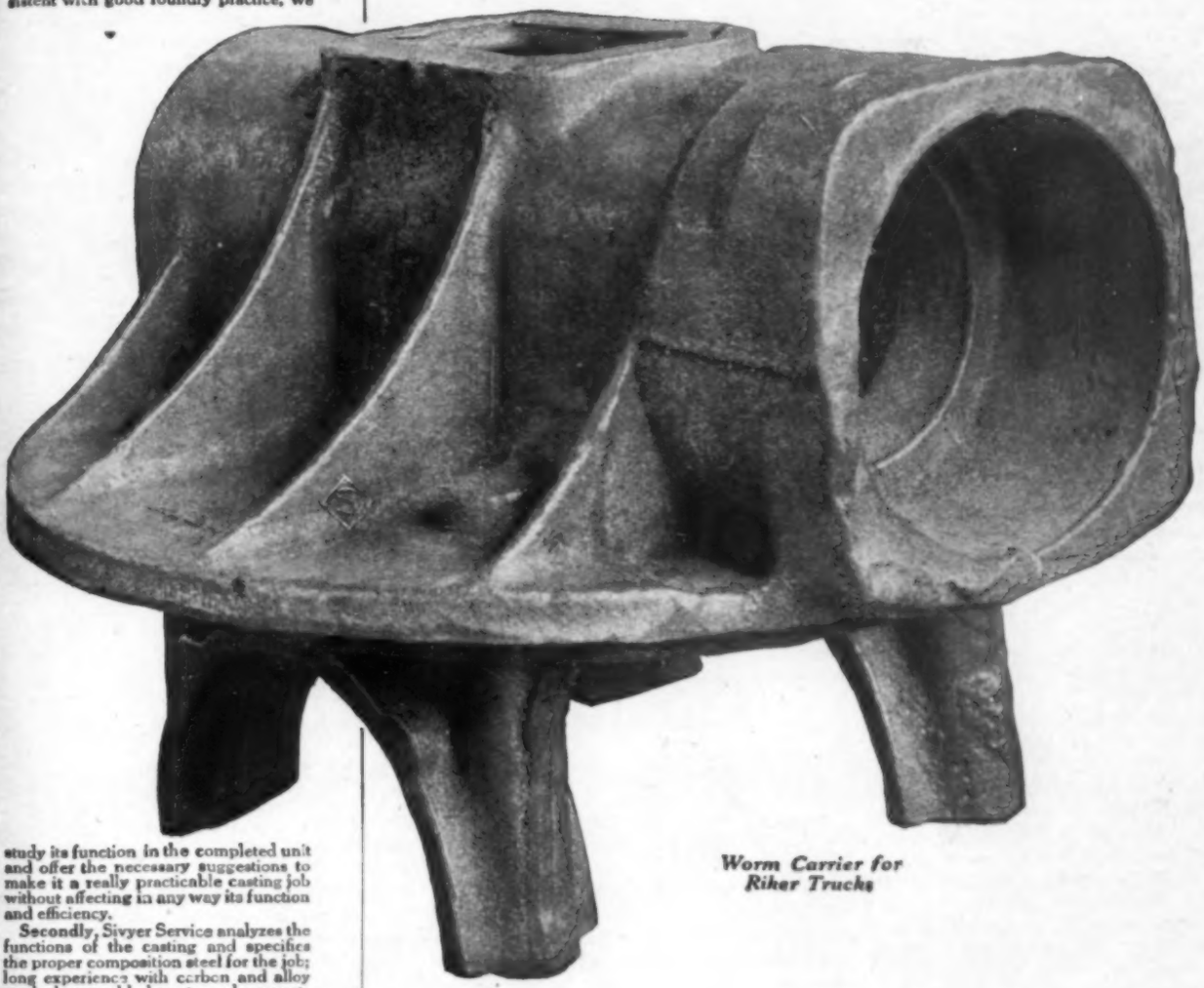
The Sivyer Service of providing Electric Steel Castings has for its objects the decrease of machining costs and the increase of wearing-quality and life. Both are attained by methods which result from long experience and begin with the design of the casting itself. When we find that a casting we are asked to furnish is of a design not consistent with good foundry practice, we study its function in the completed unit and offer the necessary suggestions to make it a really practicable casting job without affecting in any way its function and efficiency.

Secondly, Sivyer Service analyzes the functions of the casting and specifies the proper composition steel for the job; long experience with carbon and alloy steels has enabled us to reduce costs and increase quality remarkably for many different industries.

Thirdly, Sivyer Service makes a careful study of the pattern and molding problems involved, for improper gating and insufficient risers are often the greatest wasters of machining labor and metal.

Fourthly, Sivyer Service analyzes carefully the proper annealing methods to be used and controls their proper application through unfailingly efficient equipment and men. In short, the Sivyer Service supervises every step necessary to secure unusually and unfailingly good castings of electric steel. It never relies on one factor alone, relies very little even on the natural freedom of electric steel from occluded gases and on its commonly recognized merit in resisting crystallization. It also depends but little on the inherent scientific accuracy of the electric furnace process. From casting-design to sand-blasting and tumbling, the fundamental superiority of Sivyer Steel is due to its men and metal. Their value is best proved by the fact that, although the production of steel castings is generally looked upon as a local one, the Sivyer market is national.

SIVYER (S) CASTINGS



Worm Carrier for Riker Trucks

SUCCESSFUL solutions of the molding and riser problems involved in making such parts as worm carriers are typical of Sivyer Castings. Proper coring out, and the avoidance of shrink holes and cracks where the thin parts join the thick, mean much to the truck manufacturer in the matter of reduced machining costs. And they mean still more to him, and to the user of his product, by making sure of strength and long life.

SIVYER STEEL

SIVYER STEEL CASTING COMPANY, MILWAUKEE

$100,000, has been chartered by William R. Farrard, Nicholas J. Fleming and Leo M. Butzel.

DETROIT.—The Liberty Machines Corp., capitalized at $100,000, has been chartered in Delaware to manufacture weighing machines by William Barnes and associates.

DETROIT.—The Michigan Copper & Brass Co., 1611 West Jefferson avenue, is building a 1-story, 74 x 176-foot factory.

DETROIT.—The American Radiator Co., 126 Jefferson avenue, recently let a contract for alterations and repairs to its factory.

LANSING, MICH.—The Michigan Steel Sales Co. has been incorporated, with headquarters at Detroit, with $5000 capital by John J. Hamel, Leonard C. Vecelius and Clarence A. Eldridge.

MACKINAW CITY, MICH.—The Michigan Central railroad car and engine repair shops recently were damaged by fire.

MARQUETTE, MICH.—The city plans to sell $100,000 in bonds in order to finance the erection of a new unit to the city's electric light plant.

SAGINAW, MICH.—Mitts & Merrill, 1909 South Water street, will build a machine shop costing $87,000.

AURORA, ILL.—The Acetylene Gas Co. has let a contract for the repairing of its plant, to John McKimmie.

CHICAGO.—The Chicago Gear & Mfg. Co. will build a 1-story plant costing $40,000.

CHICAGO.—The Ludlow Typograph Co. will build a 1-story plant, 50 x 135 feet, to cost $20,000.

CHICAGO.—The Active Brass Co., capitalized at $5000, has been chartered by Royal C. White, Orison H. Hays and Bernard W. Vinissky.

CHICAGO.—The Finkel Bros. Co., Cortland street, contemplates the erection of an addition to its foundry on Kingsbury street.

CHICAGO.—The Kedzie Foundry Co., 3234 West Thirty-fourth street, has had plans prepared for the erection of a foundry, 46 x 60 feet.

CHICAGO.—The Montague Iron Works of Illinois, capitalized at $100,000, has been chartered by M. Desmond, T. J. Lee and E. Horan.

CHICAGO.—The National Steel Co. recently was incorporated with $10,000 capital, by Harry G. Masten, Millie F. O'Connor and Charles G. Hutchinson.

CHICAGO.—The Interstate Metals Refining Co., capitalized at $25,000, has been chartered by George W. Killela, Thomas M. Poynton and Hugo J. Thel.

CHICAGO.—The Edward Katzinger Co., manufacturers of pans, etc., has purchased a site on which it plans to erect a 7-story plant.

CHICAGO.—The Montague Iron Works recently was incorporated with $100,000 capital by M. Desmond, T. J. Lee and E. Horan.

CHICAGO.—The Interstate Metals Refining Co. has been incorporated with $25,000 capital by George W. Killilea, Thomas M. Poynton and Hugo J. Thel.

CHICAGO.—The Chicago Scale Co., 7700-40 Chicago avenue, has suspended all extensions and improvement work for the time being.

CHICAGO. — International Machine Co., 2614-24 West Sixteenth street, contemplates the erection of a machine shop addition, 2-story, 16 x 33 feet.

CHICAGO.—The Cockran Pipe Wrench Co., 7800 Woodlawn avenue, has had plans prepared for a 2-story, 36 x 100-foot factory.

CHICAGO.—The Mead Cycle Co., 33-35 North Canal street, recently acquired a plant and will install new machinery.

CHICAGO.—The Chicago Shipbuilding Co. has obtained a permit to erect four brick and frame buildings, to cost $31,500.

CHICAGO.—The Acme Boiler & Tank Co., 1017 West Forty-eighth street, will build a machine shop and factory, 52 x 85 feet.

CHICAGO.—The American Machine Works, capitalized at $1000, has been chartered by A. E. Nelson, S. C. Larson and L. M. Faber.

CHICAGO.—The Liberty Metallic Co. recently was incorporated with $10,000 capital by Peter G. Jacobson, Carl E. Forsburg and Burton O. King.

CHICAGO.—The International Harvester Corp. is building a new foundry at its Plano Works, West Pullman, Ill.

CHICAGO.—The Charles C. Kawin Co. is supervising the erection and equipment of a foundry which is being built for Montgomery, Ward & Co., Chicago, at Springfield, Ill.

CHICAGO.—Lawrence B. Palmer-Ball, manufacturer of machinery, has bought a site, which is improved with four buildings, and which he will improve and use as a manufacturing plant.

CHICAGO.—The Hennig Engine Co., capitalized at $100,000, has been chartered by William McKinley, E. F. Benkley, and Roy A. Nutt, 29 South La Salle street.

CHICAGO.—The Lakeview Iron Works, 1225 Belmont avenue, capitalized at $10,000, has been chartered by C. Oscar Carlson, Earl S. Walker and Josephine Johnson.

CHICAGO.—The National Steel Co., capitalized at $10,000, has been chartered by Millie F. O'Connor, Charles H. Hutchinson and Harry G. Masten, 4318 Schubert avenue.

CHICAGO.—The Sheet Metal Construction Co., 2019 Laflin street, capitalized at $5000, has been chartered by William Kessler, George Rose and Roy D. Oldfield.

CHICAGO.—The Armstrong Bros. Tool Co., J. A. Armstrong, president, 339 North Francisco avenue, is having plans prepared for a one and two-story plant costing $65,000, to be erected next spring.

CHICAGO.—Clement A. Hardy, consulting engineer, Railway Exchange building, is supervising the erection of a plant for the Hercules Gas Engine Co., Evansville, Ind., and a foundry for the Fairbanks-Morse Mfg. Co., Beloit, Wis.

CHICAGO.—Gustav Lidseen, machinery specialist, purchased from the Makutchan Roller Bearing Co., a plot of land, 240 x 400 feet. Part of the plot is improved with a 2-story brick building. Improvements costing $15,000 will be made.

CHICAGO.—The Peoples Gas Light & Coke Co., 122 South Michigan avenue, contemplates the erection of a gas plant and drainage canal, to cost about $7,500,000. The first unit of the plant will go ahead after Jan. 1.

CHICAGO.—John Jarvey, care of the Semo Steel Test Foundry Co., 4916 Bloomingdale avenue, plans the erection of a foundry, 49 x 85 feet. Thomas H. Mullay, 701, 179 West Washington street, is architect. Bids will probably be taken in the spring.

CHICAGO.—Hiram W. Cooley of the Machinery Warehouse & Sales Co. recently acquired a plot of land, part of which is improved with a 1-story steel building. It is thought additions will be built within a short time.

EAST ST. LOUIS, ILL.—Bids are being taken for the erection of a foundry for the Missouri Malleable Iron Co., to be 23 x 150 feet.

GOLCONDA, ILL.—The National Lead & Fluor Spar Co., capitalized at $50,000, has been chartered by Francis Baker, T. C. Miller and V. F. Anderson.

JOLIET, ILL.—The plant of the Union Wrapping Machine Co. recently was badly damaged by fire.

Throughout the West

HALLOCK, MINN.—Bids will be received until Jan. 7 by F. J. Wickie, village clerk, for a 60,000-gallon steel tank.

ST. PAUL, MINN.—The Siems & Shepley Co. is making plans for a car repair plant to be built next spring on a 21-acre site.

CLARINDA, IOWA.—Plans are being prepared for waterworks improvements for which a bond issue of $75,000 has been voted. Burns & McDonnell, Kansas City, Mo., are engineers.

DES MOINES, IOWA.—Advance Rumley Thrasher Co. is having plans prepared for the erection of a factory and warehouse to cost $125,000.

ALTENBERG, MO.—The Altenberg Light & Power Co. will build its burned electric plant.

ST. LOUIS.—The Lewin Metals Corp., 23 Branch street, has started work on the erection of a foundry.

ST. LOUIS, MO.—The Warren Steel Casting Co. has temporarily postponed the erection of a new plant. It is probable the project will be taken up later.

ST. LOUIS.—The Inland Machine Co., Seventeenth and Locust streets, will take bids soon for a 2-story machine shop, 75 x 400 feet. O. G. Stark is general manager.

COTTER, ARK.—The Dixie Pump Co. is making plans for a hydroelectric pumping plant. Walker Powell is president.

FORT SMITH, ARK.—Commissioners of Sebastian county are planning a bond issue of $500,000 for a bridge across Arkansas river.

AUSTIN, TEX.—The Texas Steel Products Co., Wichita Falls, recently was incorporated with $50,000 capital by A. C. Page, H. L. Hagerman and J. F. Pickle.

FORT WORTH, TEX.—The American Can Co., 104 South Michigan avenue, Chicago, is said to be contemplating the erection of a can factory here.

HOUSTON, TEX.—Plans are being prepared for the additions of pumps, motors and electric generator for the central waterworks plant. E. E. Sands is city engineer.

FORT WORTH, TEX.—The Evans-Thwing Co. contemplates the erection of an oil refinery of 3500 barrels capacity.

FORT WORTH, TEX.—The Gulf Well Machinery Co. recently moved its foundry here, and contemplates the erection of a 5-ton furnace, brass and aluminum foundry, forge shop and pattern shop.

FORT WORTH, TEX.—Property adjoining the roundhouse of the Texas & Pacific railroad, recently was purchased by the Peden Iron & Steel Co., and according to reports, a large plant will be erected here.

CUSHING, OKLA.—The city of Cushing and the Empire Refining Co. are having plans prepared for improvements to the waterworks plant.

ARMOURDALE, KAN.—Wilson & Co. recently let a contract for the erection of a machine shop, 3-story, 50 x 60 feet.

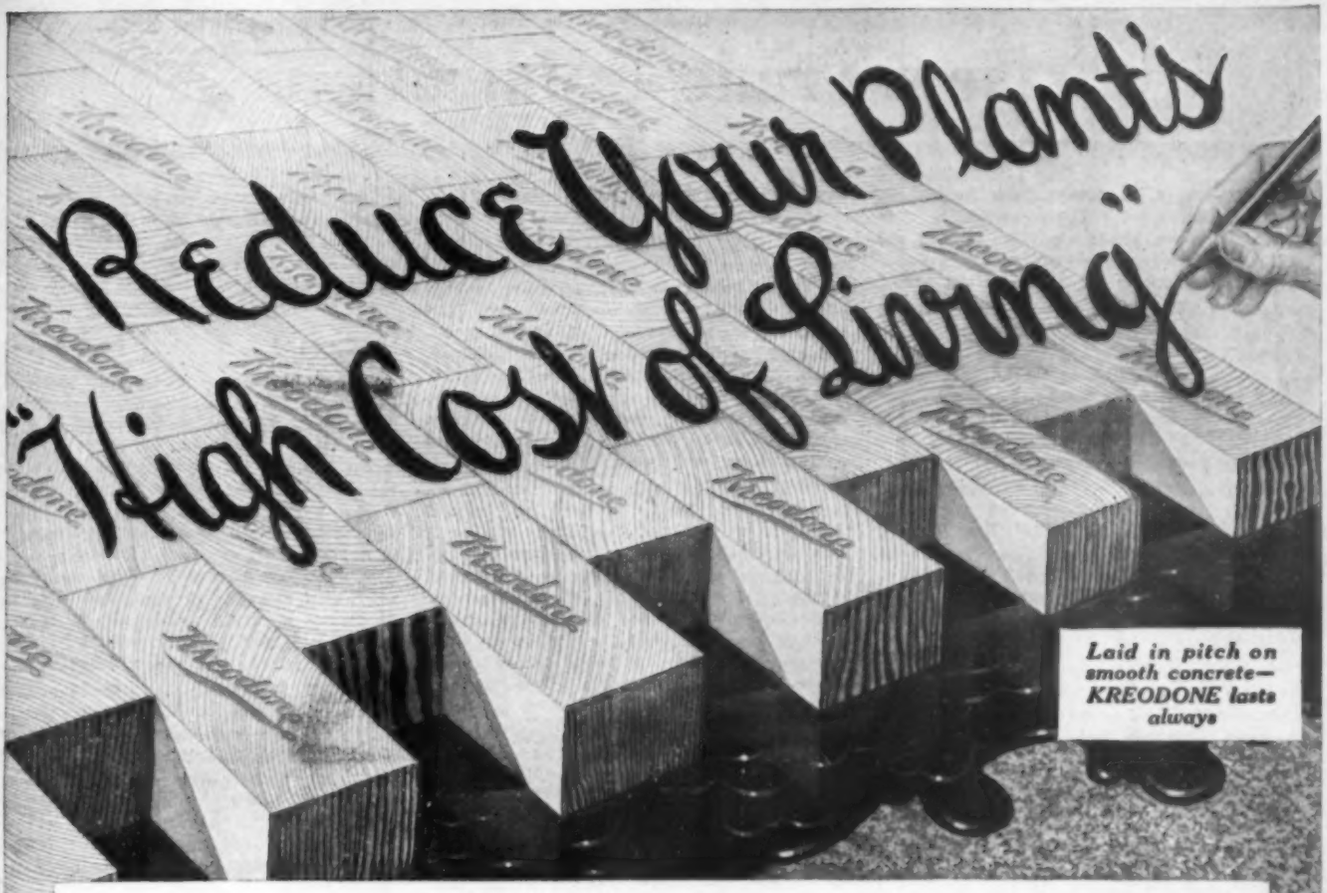
MITCHELL, S. DAK.—Plans are being made for improvements to the waterworks system, including a pumping station, 40 x 100 feet, with a 125-horsepower boiler and a 1,500,000-gallon pump. Sidney Smith is city engineer.

DENVER.—Sealed proposals will be received at the office of the United States reclamation service, until Dec. 16, for furnishing 840 lineal feet of metal flume, under specification 172-D. Address, F. E. Weymouth, United States Reclamation Service, Denver.

GREAT FALLS, MONT.—The War Industries board has reversed its rulings on building activities, and now sanctions the erection of a mill by J. F. Blecker, Ira Goodman and Charles Lewis, at a cost of $800,000.

SILVER CITY, IDAHO.—Owyhee, Canyon and Ada counties are planning to build five bridges.

WALLACE, IDAHO—It is reported that construction of a concentrating plant planned by the Nabob Mining Co. a year ago, is to begin soon.



No Tar "Smudge" on Kreodone Blocks

Their Surface is Free From Sticky and Adhesive Matter

KREODONE Floor Blocks are treated *only* with pure creosote oil. This high grade oil is free from coal tar or pitchy adulteration. The result is that a KREODONE floor will never exude that black, gummy substance which makes a nuisance of itself, and furthermore indicates cheapness. Another and a bigger result is that KREODONE blocks wear forever—they have greater durability than steel.

The floor is the foundation for your machinery. It must be "right" if your machines are to give you the best results. Plank, block, cement, or inferior wood block floors are the "high cost of living" of your plant. Re-floor *now*, and *permanently*, with

Kreodone EVERLASTING **Wood Block Floors**

With KREODONE Floors you are saving money and trouble. You are providing sanitary, dust-proof flooring for your workmen. You are giving them a warm, dry floor which will give them a level, secure, comfortable footing and consequently the added energy to produce more.

And it LASTS. When your other floors have splintered and crumbled you will find your KREODONE Floor "tendin' to bizness at the same old stand."

Write us for full particulars about KREODONE Floors. Post up. You will soon be "needin'" it.

REPUBLIC CREOSOTING COMPANY, Indianapolis, Indiana

Plants: Indianapolis Minneapolis Mobile Seattle Norfolk

New Trade Publications

PUMPS.—The A. S. Cameron Steam Pump Works, New York, has issued a 12-page booklet, in which pumps for marine service are fully described and illustrated. This bulletin contains sectional and complete views, as well as full descriptions and tables.

FACTORY FENCES.—An attractive 24-page catalog, in which chain-link, woven-steel fences, suitable for factories and industrial plants, are described, is being circulated to the trade by the Anchor Post Iron Works, New York. The catalog is profusely illustrated showing installations of these metal fences at industrial plants and factories. The posts of these fences are made of high-carbon steel.

ANNEALING FURNACES—A type of furnace used for bright annealing copper wire, brass copper, phosphor bronze, cartridge cases and similar products, is described and illustrated in a 4-page pamphlet recently issued by the W. S. Rockwell Co., New York City. The booklet contains several excellent illustrations of the furnace in operation together with a detailed description of its construction and operation.

BURNERS.—Oil and gas burning equipment is thoroughly described and illustrated in a 12-page booklet recently issued by the Gwynn Engineering Co., Pittsburgh. The gas burner is equipped with a quick-opening, indicating-dial gas valve, which provides a handy appliance and time saver. Other equipment of oil and gas burning devices are described.

STARTING SWITCH.—An attractive 2-page leaflet recently was issued by the Cutler-Hammer Mfg. Co., Milwaukee, in which starters for squirrel-cage motors are described. The operating handle of the starter is outside the enclosing case, and may be locked in the "off" position if desired to prevent operation during repairs to the motor or machine. The starter embodies practically all safety precautions in the running of electrical machinery.

COAL HANDLING.—The Link-Belt Co., Chicago, has published a 52-page booklet in which ways and means of handling coal and ashes economically are described and illustrated. Complete boiler room equipment, with descriptions of all conveying devices, manufactured by the company are given. The booklet contains data on the loss of coal, in transit from the coal cars to the furnace room where it is eventually consumed.

MELTING FURNACES—A bulletin recently issued by the W. S. Rockwell Co., New York, describes and illustrates the company's line of tilting, reverberatory melting furnaces for nonferrous metals. The furnaces are made in capacities ranging from 500 to 2000 pounds. One of the latest types described is a mechanically operated tilting furnace with a nominal capacity of 2000 pounds. Tilting is accomplished by means of an air hoist, the furnace pivoting about an axis running through the pouring spout.

INDUSTRIAL BUILDINGS.—An attractive booklet, in which standardized commercial and industrial buildings are described and illustrated is being circulated by the Gaylord W. Feaga Co., construction engineers, Cleveland. The book tells of intensive effort in industrial construction, the standardization of factory buildings, and speed in erecting buildings of permanent qualities. The booklet gives a list of clients of the company, many of which are iron and steel producers.

GAS VALVES—The Steere Engineering Co., Detroit, recently published a 16-page catalog, with a supplement in which gas valves and welded steel pipe, manufactured by the company, are fully described and illustrated. The principal dimensions of valves as well as the standard dimensions of welded steel fittings are given. The standard dimensions of welded pipe and flanges are also given. The catalog supplement contains a number of illustrations showing typical views of welded and riveted construction done by the company.

PULVERIZING MACHINERY.—The Raymond Bros. Impact Pulverizer Co., Chicago, has issued an attractive 62-page booklet, in which pulverizing, grinding and air separating machinery are described and illustrated. The booklet contains a list of users of this machinery, including a number of carbon and coke, cement, chemical, coal, copper and metal companies. With the pulverizer, the great bulk of materials, such as coal, coke, gypsum, limestone, phosphate rock and similar products, are reduced to a fineness of about 95 per cent through 100-mesh.

STEEL BUILDINGS.—The Milliken Bros. Mfg. Co., Inc., New York, recently published an illustrated booklet, in which a description of the standardized truss unit system of building construction is given. This system of erection is suitable for all classes of industrial and manufacturing buildings, making use of a common steel unit, both for columns and trusses. No plans are necessary and the buildings are either permanent or portable. The booklet contains a number of illustrations showing buildings of this type which were erected for the United States government.

ELECTRICAL HEAT UNITS.—A 4-page descriptive bulletin entitled "Miscellaneous Applications of Electrical Heat by Means of Standardized Units," is being circulated to the trade by the Cutler-Hammer Mfg. Co., Milwaukee. These heating units are known as space heaters, and are the same size as two feet of lath. The bulletin makes special mention of the applications of these units, among which are: Crane and hoist cabs, meter houses, detached or exposed rooms, valve houses, sprinkler houses, etc. A blueprint which accompanies the bulletin gives dimensions of these standardized units.

TURRET LATHES—The Wood Turret Machine Co., Brazil, Ind., recently issued an attractive 40-page catalog, in which a tilted turret lathe is described and illustrated. The machine is semiautomatic. It is equipped with an automatic feed, which can be changed at any time without stopping the machine. Because of the automatic continuous bar feed, it is possible to feed a light brass tubing into the machine without injury. The book also contains a list of sizes and general information concerning the tools of the company.

STEEL WINDOWS.—The Detroit Steel Products Co., Detroit, has published a 41-page illustrated catalog showing the construction and installation of steel sash windows. Valuable information on the removal of heat and gases from foundries or shops of the so-called "hot building" type is contained. Detailed drawings of the different forms of sash construction explain fully the different construction principles, while photographic illustrations depict the windows in service. Both hand and electrically controlled operating devices are used with these windows.

FUEL OIL ENGINE.—A bulletin containing 32 pages, issued by the Chicago Pneumatic Tool Co., Chicago, is devoted to semidiesel fuel oil engines, which operate on any petroleum distillate that does not contain more than 1 per cent sulphur and from 28 to 40 degrees Beaume scale. The engine is of the horizontal, straight line, crosshead type and in the larger sizes it is mounted on a substantial base, so designed that when the machine is in operation it is free from vibration. The bulletin illustrates and describes the various parts of this machine and gives dimensions of sizes and capacities.

STEEL PRODUCTS—The Interstate Iron & Steel Co., Chicago, recently issued another edition of its catalog, in which complete information regarding the company's iron and steel products is given. The catalog contains 204 pages. Bars, bands, angles, channels, tees, flats and special shapes, with sizes listed for both wrought iron and steel tieplates, are described and illustrated. Alloy and special analysis steels are also described, as well as the company's wire and wire products, which include nails, rivets, etc. The booklet also contains the national iron and steel standard cards of extras, as well as a number of tables of weights and gages and other valuable information.

TURRET LATHES. — The Gisholt Machine Co., Madison, Wis., has issued a catalog describing its turret lathes. The catalog contains numerous illustrations showing the lathes set up for actual machining operations, the better to enable the operator and the tool designer to understand the possibilities of the machine. These machines are designed for rapid production and are adapted for precision work. Many line drawings of various machine parts are also given. These are dimensioned and the operating time for finishing each piece is given. A description of the machine is included together with illustrations of standard tools used in connection with it such as boring heads, boring bars, reamers, chucks, etc.

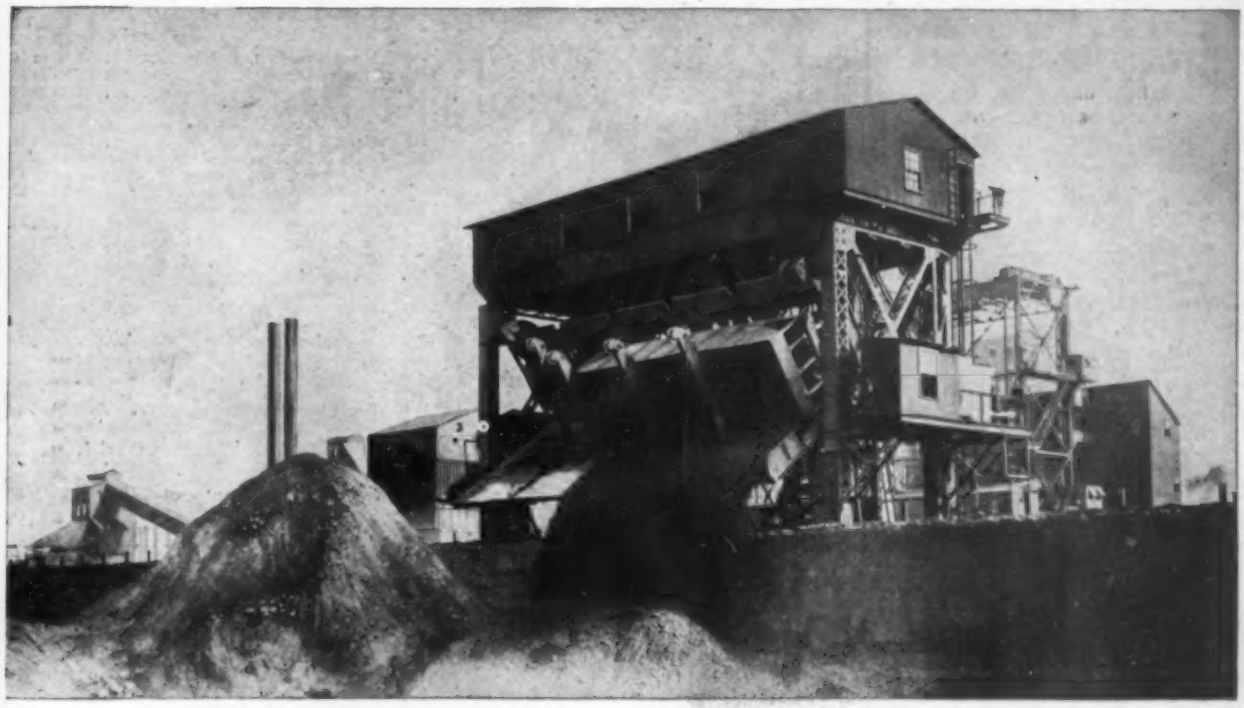
FACTORY BUILDINGS.—A handsomely illustrated 64-page catalog, issued by the Austin Co., engineers and builders, Cleveland, describes the Austin method of standard factory building construction. This method is described as one by which permanent factory buildings are erected quickly by eliminating delays and by standardization. This method provides for various industrial types of construction by standardized designs. Thus the time ordinarily required for preparation of special plans is saved. Nine types of standard buildings are described, several of which are adapted to foundry use.

TOOL STEELS.—The Carnegie Steel Co., Pittsburgh, has issued a pamphlet devoted to electric tool steels. The pamphlet is well illustrated and contains much valuable information regarding the classification, manufacture and chemical composition of steel. The subjects of hardening, annealing, heat treating and tempering are also described. Of especial interest to the practical man are two color tables. One shows the corresponding color for various degress of heat from 900 to 2200 degrees Fahr., and 482 to 1204 degrees Cent., while the other illustrates temper colors. Under the different colors is given a list of various tools and their proper degrees of temper. The pamphlet also includes several tables giving the weights of flat rolled steel and weights of square, round, hexagon and octagon bars. The pamphlet is intended for the actual user of tool steels and for this reason contains essential information without extended theoretical discussions.

AIR AND LIGHT IN FOUNDRIES AND FORGE SHOPS.—48-page monograph, entitled "Air and Light in Foundries and Forge Shops," in which the influence of sash and roof formation on the illumination and ventilation of casting plants and forge shops is pointed out, has been issued by the David Lupton's Sons Co., Philadelphia. Foundry and forge shop illumination and ventilation have received more than ordinary attention during the past few years. The latest practice is to make a radical departure in the design of the building, in its floor layout as well as in the sash. In the best ventilated buildings all three elements have been carefully correlated. This monograph contains a large number of interior and exterior views of foundries throughout the country in which the subject of lighting and ventilation has been given careful attention and in which the continuous sash and the truss construction of this company have been utilized. Included in this monograph are a number of cross-sections of various important foundries throughout the country equipped with this company's sash, roof trusses, etc. The theory and practice of ventilating these buildings also are graphically shown.

W-S-M

STEEL PLANT EQUIPMENT
COKE OVEN MACHINERY
GAS PRODUCERS
ORE AND COAL HANDLING MACHINERY
SPECIAL CRANES
MINING MACHINERY
HYDRAULIC TURBINES



Ore and Coal Handling Machinery

To those contemplating the erection of plants for the loading, unloading, conveying or storage of ore or coal, we offer the exceptional experience of our engineering staff, supplemented by extensive and modern manufacturing facilities.

Specific inquiries are invited.

The Moving Car Dumper illustrated was built for the Youngstown Sheet & Tube Co. This Machine unloads into storage 300 cars per day.

Bulletin A9, "W-S-M Car Dumpers" contains much interesting information. Write for your copy.

THE WELLMAN-SEAVER-MORGAN CO.

CLEVELAND, OHIO, U.S.A.

Iron and Steel Prices

Corrected to Tuesday Noon

IRON ORE

Superior Ores, Per Ton, Lower Lake Ports	
Old range Bessemer, 55 iron	$6.65
Mesabi Bessemer, 55 iron	6.40
Old range non-Bess., 51½ iron	5.90
Mesabi non-Bess., 51½ iron	5.75

WAREHOUSE PRICES

Steel bars, Chicago	4.17c
Steel bars, Cleveland	4.07c
Steel bars, Detroit	4.13c
Steel bars, Philadelphia	[illegible]
Steel bars, New York	4.17c
Steel bars, St. Louis	4.24c
Steel bars, Cincinnati	4.13c
Steel bars, St. Paul	4.395c
Steel bars, Buffalo	4.10c
Iron bars, Buffalo	4.70c
Iron bars, Chicago	4.77c
Iron bars, Cleveland	4.67c
Iron bars, Detroit	4.75c
Iron bars, St. Louis	4.84c
Iron bars, Cincinnati	4.13c
Iron bars, Philadelphia	4.745c
Iron bars, News York	4.77c
Shapes, Chicago	4.27c
Shapes, Detroit	4.23c
Shapes, St. Louis	4.34c
Shapes, St. Paul	4.495c
Shapes, New York	4.27c
Shapes, Cleveland	4.17c
Shapes, Philadelphia	4.245c
Shapes, Buffalo	4.20c
Shapes, Cincinnati	4.23c
Plates, Buffalo	4.45c
Plates, Chicago	4.52c
Plates, Detroit	4.48c
Plates, St. Louis	4.59c
Plates, St. Paul	4.745c
Plates, New York	4.52c
Plates, Cleveland	4.42c
Plates, Philadelphia	4.495c
Plates, Cincinnati	4.48c
No. 10 blue anl. sheets, Chicago	5.52c
No. 10 blue anl. sheets, Cleveland	5.42c
No. 10 blue anl., Buffalo	5.45c
No. 10 blue anl. sheets, St. L.	5.59c
No. 10 blue anl. sheets, Cincinnati	5.48c
No. 10 blue anl. sheets, St. Paul	5.745c
No. 10 blue anl. sheets, Detroit	5.48c
No. 28 black sheets, Chicago	6.52c
No. 28 black sheets, Cleveland	6.42c
No. 28 black sheets, Cincinnati	6.48c
No. 28 black, Detroit	6.48c
No. 28 black sheets, St. L.	6.59c
No. 28 black sheets, St. Paul	6.745c
No. 28 galv. sheets, Chicago	7.77c
No. 28 galv. sheets, Cleveland	7.67c
No. 28 galv. sheets, Cincinnati	7.73c
No. 28 galvanized, Detroit	7.73c
No. 28 galv. sheets, St. L.	7.84c
No. 28 galv. sheets, Buffalo	7.70c

IRON AND STEEL SCRAP

(Prices in Gross Tons)

STEEL WORKS USE

Bundled sheets, Cincinnati	$23.00 to 24.00
Bundled sheets, Pittsburgh	24.00 to 25.00
Bundled sheets, Cleveland	24.00 to 25.00
Bundled sheets, Buffalo	21.00 to 22.00
Boiler plate, cut, No. 1, Chicago	18.00 to 19.00
Boiler plate, cut, No. 1, St. Louis	16.50 to 17.00
Frogs, switches, guards, St. Louis	26.00 to 26.50
Frogs, switches, guards, Chicago	24.00 to 25.00
Heavy melting steel, Pittsburgh	26.00 to 27.00
Heavy melting steel, Buffalo	24.00 to 25.00
Heavy melting steel, Chicago	24.00 to 25.00
Heavy melting steel, Cleveland	26.00 to 26.50
Heavy melting steel, Cincinnati	26.00 to 27.00
Heavy melting steel, east. Pa.	22.50 to 23.00
Heavy melting steel, N. Y.	17.00 to 18.06
Heavy melting steel, St. L.	25.50 to 26.00
Heavy melting steel, Birmingham	21.00 to 22.00
Baled shets, Cleveland	26.00 to 27.00
Baled sheets, Pittsburgh	25.00 to 26.00
Baled sheets, Chicago	23.00 to 24.00
Knuckles, couplers, Chicago	27.00 to 28.00
Knuckles, couplers, St. Louis	28.00 to 28.50
Low phos. steel, Buffalo	29.00 to 30.00
Low phos. steel, Pittsburgh	34.00 to 35.00
Low phos. crops, eastern Pa.	nominal
Low phos. guaranteed E. Pa.	nominal
Shoveling steel, Chicago	24.50 to 25.00
Shoveling steel, St Louis	24.00 to 24.50
Steel rails, short, Chicago	27.00 to 28.00
Steel rails, short, Cleveland	27.00 to 28.00
Steel rails, short, St. Louis	26.00 to 26.50
Steel rails, old, Birmingham	24.00 to 25.00
Stove plate, Chicago	20.50 to 21.50
Stove plate, Cincinnati	20.00 to 20.50
Stove plate, St. Louis	18.00 to 18.50
Stove plate, N. J. points	18.50
Stove plate, Birmingham	18.00 to 19.00
Stove plate, Buffalo	25.00 to 26.00
Stove plate, eastern Pa.	25.50 to 26.50
Stove plate, Cleveland	21.50
Stove plate, Pittsburgh	24.00 to 25.00

Freight Rates, Pig Iron

[illegible] and Shenango valleys to:

[illegible]	$1.40
Newark, N. J.	4.80
Boston	5.20
Philadelphia	4.40
Pittsburgh	1.40
St. Louis	4.60
Minneapolis, St. Paul	5.70
Buffalo to:	
Albany, N. Y.	$1.75
New England (rail)	3.90
New York and Brooklyn (rail)	3.90
Virginia furnaces to:	
Philadelphia	$4.10
New England	4.70
Brooklyn, Jersey City, Newark	4.40
Birmingham, Ala., to:	
Boston	$3.00
Cincinnati	3.60
Chicago	5.00
Cleveland	5.00
Louisville, Ky.	3.30
Minneapolis, St. Paul	7.30
New York	7.70
Philadelphia	6.50
Pittsburgh	5.70
Savannah, Ga.	3.40
St. Louis	4.25
Chicago to:	
Des Moines	$3.50
Minneapolis, St. Paul	2.50
Milwaukee	.60
Moline, Ill.	1.40
Omaha	4.50
St. Louis	1.90
Ironton and Jackson, O., to:	
Chicago	$3.80
Cincinnati	1.80
Cleveland	2.40
Detroit	2.60
Indianapolis	2.30
Minneapolis, St. Paul	5.70

Freight Rates, Finished Material

Pittsburgh, carloads, per 100 lbs., to:	
New York	27.0 cents
Philadelphia	24.5 cents
Boston	30.0 cents
Buffalo	21.5 cents
Baltimore	23.0 cents
Cleveland	17.0 cents
Cincinnati	23.0 cents
Chicago	27.0 cents
Detroit	23.0 cents
Minneapolis and St. Paul	49.5 cents
Denver	$1.09
St. Louis	38.5 cents
New Orleans	38.5 cents
Birmingham	57.5 cents
Pacific coast (all rail)	$1.25
Pacific coast (tin plate)	1.25

IRON MILL USE

Busheling, No. 1, Cleveland	26.00
Busheling, No. 1, Buffalo	22.00 to 23.00
Busheling, No. 1, Pittsburgh	26.00 to 27.00
Busheling, No. 1, Cincinnati	26.00 to 26.50
Busheling, No. 1, Chicago	25.00 to 26.00
Busheling, No. 2, Chicago	16.00 to 17.00
Busheling, No. 1, St. Louis	25.00 to 26.00
Cast borings, New York	12.75 to 13.25
Cast borings, eastern Pa.	16.50 to 17.50
Cast borings, Buffalo	16.00 to 17.00
Cast borings, Cleveland	16.00 to 16.50
Cast borings, Cincinnati	14.50 to 15.00
Cast borings, Pittsburgh	15.00 to 16.00
Cast borings, Birmingham	16.00 to 17.00
Cast borings, Chicago	14.50 to 15.00
Cast borings, St. Louis	14.50 to 14.50
City wrought, long, N. Y.	27.00 to 27.50
Cut forge, Chicago	26.00 to 27.00
Forge No. 1, eastern Pa.	23.00 to 24.00
Forge flashings, large, Cleveland	25.00
Forge flashings, small, Cleveland	26.00 to 26.50
Grate bars, Buffalo	23.00 to 24.00
Grate bars, Cleveland	22.00 to 23.00
Grate bars, N. J. points	18.50
Iron axles, Pittsburgh	46.50
Iron axles, Cincinnati	43.00 to 44.00
Iron axles, Cleveland	39.00 to 40.00
Iron axles, Chicago	40.00
Iron axles, eastern Pa.	nominal
Iron axles, St. Louis	38.00 to 38.50
Iron axles, Buffalo	37.00 to 38.00
Iron rails, Chicago	33.00 to 34.00
Iron rails, Buffalo	30.00 to 31.00
Iron rails, Cincinnati	33.00 to 34.00
Iron rails, St. Louis	33.50 to 34.00
Iron rails, Cleveland	35.00
Machine turnings, Cincinnati	15.00 to 15.50
Machine turnings, Cleveland	15.50 to 16.00
Machine turnings, Buffalo	15.00 to 16.00
Machine turnings, N. Y.	12.75 to 13.25
Machine turnings, Pittsburgh	15.00 to 16.00
Machine turnings, east. Pa.	17.00 to 18.00
Machine turnings, Birmingham	16.00 to 17.00
Machine turnings, Chicago	12.50 to 13.00
Machine shop turnings, St. Louis	14.50 to 15.00
Pipes and flues, Cleveland	24.50 to 25.00
Pipes and flues, Chicago	20.50 to 21.50
Pipes and flues, St. Louis	18.50 to 19.00
R. R. mach. cast, No. 1, Buffalo	31.00 to 32.00
R. R. wgt. No. 1, Buffalo	27.00 to 28.00
R. R. wrgt. No. 1, east. Pa.	nominal
Railroad wrgt., No. 1, Cincinnati	30.00 to 31.00
Railroad wrgt., No. 1, Cleveland	30.00 to 31.00
R. R. wrought, No. 1, Pittsburgh	32.00 to 33.00
Railroad wrgt., No. 2, Chicago	26.00 to 27.00
Railroad wrought, No. 1, Chicago	27.50 to 28.50
R. R. wrought, No. 1, Birmingham	23.00 to 24.00
No. 1 yard wrought, eastern Pa.	29.00 to 30.00
No. 1 bushelings wrgt., east. Pa.	30.00
Sheet wrought, Pittsburgh	32.00 to 33.00
Railroad wrgt., No. 1, St. Louis	27.00 to 27.50
Railroad wrought, No. 2	26.00 to 26.50
Wrought pipe, Buffalo	21.00 to 22.00
Wrought pipe, east. Pa.	29.00 to 30.00
Wrought pipe, ungraded, east. Pa.	21.00 to 22.00

IRON OR STEEL WORKS USE

Axle turnings, Cleveland	$22.00
Axle turnings, Buffalo	20.00 to 21.00
Heavy axle turnings, east. Pa.	23.00
Heavy axle turnings, Pitts.	20.00 to 21.00
Shafting, New York	32.00
Shafting, east. Pa.	33.00 to 34.00
Shafting, St. Louis	30.00 to 31.00
Steel car axles, Birmingham	30.00 to 32.50
Steel car axles, Pittsburgh	46.50
Steel car axles, New York	30.00 to 31.00
Steel car axles, Buffalo	37.00 to 38.00
Steel car axles, Cleveland	39.00 to 40.00
Steel car axles, East. Pa.	nominal
Steel car axles, Chicago	37.50 to 38.50
Steel car axles, St. Louis	37.00 to 38.00

IRON FOUNDRY USE

Car wheels (iron), Pittsburgh	$29.00
Car wheels (steel), Pittsburgh	34.00 to 35.00
Car wheels, East. Pa.	nominal
Car wheels, Buffalo	27.00 to 28.00
Car wheels, Chicago	25.00 to 26.00
Car wheels, St. Louis	28.50 to 29.00
Car wheels, Birmingham	22.00 to 23.00
Car wheels, Cleveland	22.00
Tram car wheels, Birmingham	21.00 to 22.00
Cast, No. 1, Birmingham	23.00 to 24.00
Cast, No. 1, cupola, east. Pa.	31.00 to 32.00
Cast, No. 1, Cleveland	28.00 to 28.50
Cast, No. 1, Cincinnati	29.00 to 29.50
Cast, 1, machy., New York	25.00 to 26.00
Cast, 1, heavy, New York	25.00 to 26.00
Cast, No. 1, Chicago	29.00 to 30.00
Cast, No. 1, Pittsburgh	31.00 to 32.00
Cast, No. 1, St. Louis R. R.	25.00 to 25.50
Malleable, Cincinnati	27.00 to 27.50
Malleable, Cleveland	30.00
Malleable, Buffalo	29.00 to 30.00
Malleable, Pittsburgh	29.00 to 30.00
Malleable, East. Pa.	nominal
Malleable, cupola, East. Pa.	nominal
Malleable, railroad, Chicago	27.00 to 28.00
Malleable, agricultural, Chicago	24.50 to 25.50
Malleable, railroad, St. Louis	22.00 to 22.50
Malleable, agricultural, St. Louis	18.00 to 18.50

MISCELLANEOUS USES

Boiler punchings, Chicago	32.00 to 33.00
Reroll. rails, 5 ft. and over, Pitts.	34.00
Reroll. rails, 5 ft. and over, Chi.	27.50 to 28.00
Reroll. rails, 5 ft. and over, E. Pa.	nominal
Reroll. rails, 5 ft. and over, St. L.	27.00 to 27.50
Reroll. rails, 5 ft. or over, Cleve.	30.00 to 30.50
Rerolling rails, long, Birmingham	31.50 to 38.50
Locomotive tires, Chicago	33.00 to 34.00
Locomotive tires, St. Louis	23.00 to 23.50

TOOL STEELS

Blue Chip

High Speed

and other

FIRTH-STERLING TOOL STEELS

THE knowledge, experience and skill of SHEFFIELD combined with the best PITTSBURGH practice have made these steels the standards of QUALITY and UNIFORMITY wherever Tools are used

FIRTH-STERLING STEEL COMPANY

McKeesport, Pa.

NEW YORK BOSTON PHILADELPHIA CLEVELAND PITTSBURGH CHICAGO

Investigate

THE HAGAN

Steam Jet Ash Conveyor

The **"Hagan"** is a combination of all the good points of **other** Steam Jet Conveyors, scientifically worked in with a number of **"Hagan" Special Features.**
The result is a Steam Jet Ash Conveyor that will out-service all others in **every** particular.

The Hagan can't waste your steam unless you consent to it!

This point ***alone*** is a ***Decisive*** Feature.

HAGAN GUARANTEES INSURE

Service—Efficiency—Economy

They have backed the operation of over 5,000 Stokers sold in the last three years.

Ask us to send you our Bulletins.

George J. Hagan Company

4th Floor People's Bank Bldg.
PITTSBURGH, PA.
4th Floor Garfield Building
CLEVELAND

Sales Representatives for

Combustion Engineering Corporation
11 Broadway, New York, N. Y.

Automotive Steels

Steels for motor car, motor truck and aeroplane uses. Heavy stocks in hand ready for quick shipment. Get in touch with Aborn on your next order, because it will pay you to do so.

OTHER GOOD STEELS IN STOCK

High Speed Steel
Oil Hardening Steel
Chrome and Nickel Steels
Tool and Drill Steels
Pick, Wedge and Hammer Steels
Annealed Cutter Blanks
Music Wire for Springs
Cold Rolled Steels
Forgings
Tool Holder Steel
Vanadium Steel
Annealed Punch and Die Steels
Spring Steels
Machinery Steels
Drill Rods
Tempered Spring Wire
Drawn Steels
Iron
Specialties

CENTURY STEEL WORKS
Poughkeepsie, N. Y.

ABORN STEEL COMPANY, Inc.
24 Clarke St., New York, N. Y.

Buffalo, N. Y.—520 Marine Bank Bldg. Philadelphia, Pa.—269 Drexel Bldg. Rochester, N. Y.—133 Andrews St.

178

ILLINOIS ILLINOIS

Electric Steel

Steel of Quality and Uniformity

Standard Grades:

Special Carbon	Medium Nickel Chrome
Chrome Vanadium	High Nickel Chrome
Nickel	Low Nickel Chrome

Electric Steel is specified when high grade steel is essential, for such work as Gun Forgings, Automobile Parts, Turbine Wheels, Torpedo Heads, Roller Bearings, High Grade Tubes, etc.

The purity of Electric Steel enables the manufacturers to obtain a higher percentage of their finished product, thereby avoiding heavy losses on material on which heat treating, labor expense, etc., have been expended.

We are equipped to Anneal and Heat Treat when required.

ILLINOIS STEEL COMPANY

General Office: 208 S. LaSalle Street

CHICAGO, ILLINOIS

BRANCH OFFICES:

Birmingham: Brown-Marx Bldg.
Boston: 120 Franklin St.
Buffalo: Marine National Bank Bldg.
Cincinnati: Union Trust Bldg.
Cleveland: Rockefeller Bldg.
Denver: First National Bank Bldg.
Detroit: Ford Bldg.
New Orleans: Maison Blanche
New York: Hudson Terminal Bldg.
Philadelphia: Widener Bldg.
Pittsburgh: Carnegie Bldg.
St. Louis: Third National Bank Bldg.
St. Paul: Pioneer Bldg.

Pacific Coast Representatives: U. S. Steel Products Co., San Francisco, Seattle, Portland, Los Angeles.
Export Representatives: United States Steel Products Co., New York City

ILLINOIS ILLINOIS

THE YOUNGSTOWN SHEET AND TUBE COMPANY

YOUNGSTOWN OHIO

YOUNGSTOWN

YOUNGSTOWN YOUNGSTOWN

Pipe all looks very much alike. It is all made by the same process, finished on the same kind of machines, and shipped in much the same manner.

The difference is in the QUALITY of material used; the care bestowed on manufacture, and the skill of workmen who thread it.

In all of these features

"Youngstown" Pipe

will be found to excel. Its reputation for QUALITY covers all of these points. It is as good pipe as can be made in commercial quantities.

The Youngstown Sheet & Tube Company

Youngstown, Ohio

AMERICAN DISTRICT SALES OFFICES:

BOSTON—120 Franklin Street
NEW YORK—30 Church Street
PHILADELPHIA—Pennsylvania Building
WASHINGTON—Munsey Building
ATLANTA—Healey Building
PITTSBURGH—Oliver Building
CLEVELAND—Leader-News Building
DETROIT—Dime Savings Bank Building
CHICAGO—McCormick Building
ST. LOUIS—1139 Olive Street
DENVER—First National Bank Building
DALLAS—Great Southern Life Building
SAN FRANCISCO—604 Mission Street
SEATTLE—Central Building

YOUNGSTOWN

STEEL AND IRON PIPE - SHEETS - PLATES
BARS - WIRE - WIRE PRODUCTS
CONDUITS - ARMORED CABLES

What Pipe is Uniform
" " " Ductile
" " " Spellerized
" " " Durable
" " " Made in a Complete Line
" " " Made by One Organization from Ore to Finished Product
" " " Thoroughly Tested and Inspected
" " " Made up to Forty Feet in Length
" " " Made Full Standard Weight Only
" " " Marked to Prevent Substitution

What Pipe has High Tensile Strength
" " gives Clean, Strong Threads
" " received the Grand Prize at Panama-Pacific International Exposition, 1915
" " represents "the highest development of the art"

The An
"NATI

NATIONAL TUBE COMPANY

DISTRICT SALES OFFICES

Atlanta, Boston, Chicago, Denver, New Orleans, New York, Salt Lake City, Pittsburgh, Philadelphia, St. Louis, St. Paul

?

swer:

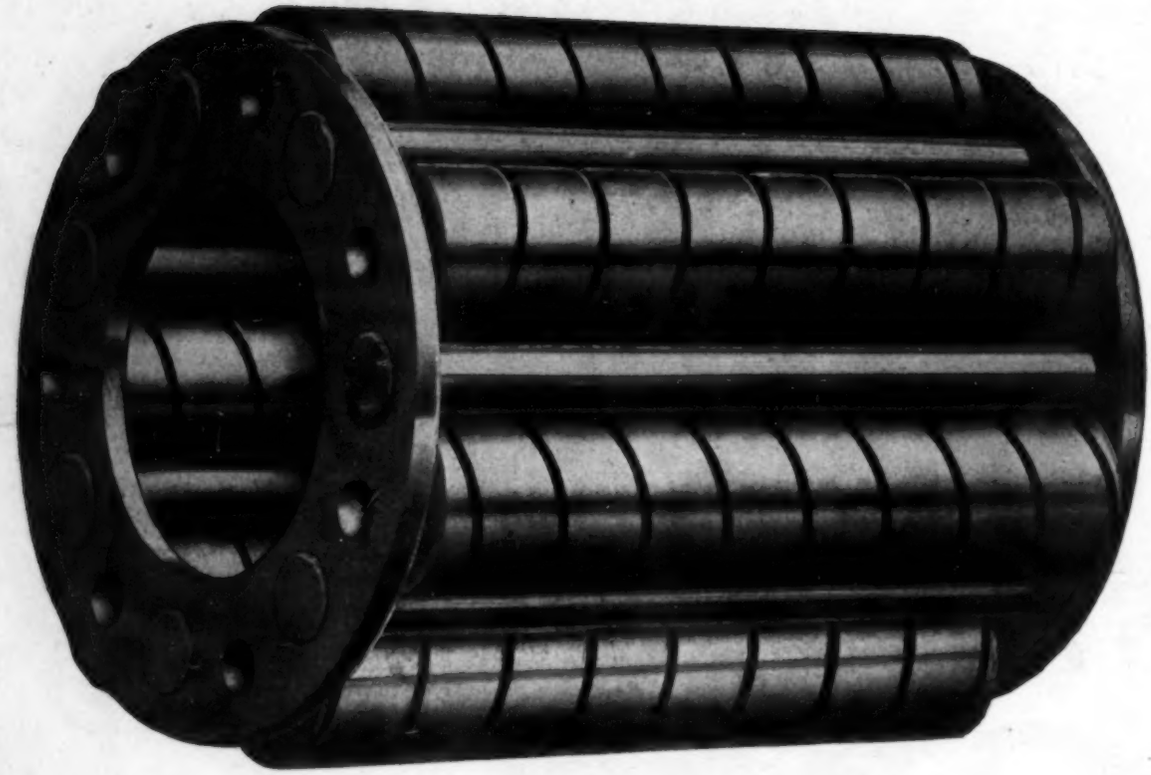
ONAL"

(General Sales Offices FRICK BUILDING) PITTSBURGH, PA.

PACIFIC COAST REPRESENTATIVES: U. S. Steel Products Co., San Francisco, Los Angeles, Portland, Seattle
EXPORT REPRESENTATIVES: U. S. Steel Products Co., New York City

It pays to be NATIONALly Prepared

PEACE WILL MEAN



HYATT ROLLER BEARINGS

CONTINUED PROSPERITY

THE event for which American Industries have confidently, yet anxiously waited since the first drop of American blood was spilled and the first American dollar was spent to forever establish the freedom and peace of the world has arrived. The war has been won and as President Wilson told the Congress, "Everything for which America fought has been accomplished."

The War Industries Board is carefully but surely clearing the road so that the industries of our country can take up, unhampered, their pre-war activities and carry them through with the knowledge gained in war times to an economic, fundamentally sound success, never known before.

In the adequate reconstruction of a war-torn world the United States will be called upon for the production of peace materials as greatly and as steadily as it was for the production of war materials.

The United States must provide for years to come:

1. ***Steel*** and the other industrial metals for their thousand important uses.
2. ***Coal*** in greater amount than ever before.
3. ***Ships*** to hold for us the place in foreign trade which the importance of our country merits.
4. ***Food*** and clothing for the weakened, war-shocked peoples of Europe.
5. ***American Machinery*** to replace machinery ruined by the demands of munition manufacture. American Machinery to re-establish the crippled industries of our Allies.

The ideals established by the combined Victory of the enlightened nations of the earth will surely lead to Peace, Happiness and Prosperity for the whole world.

The Hyatt Roller Bearing Company feels that the ensuing years will be the most prosperous years in the history of the United States.

1854

HYATT ROLLER BEARING COMPANY,
METROPOLITAN TOWER, NEW YORK

HYATT ROLLER BEARINGS

Genuine Walworth" Stillson"

(1) Fifty Years of Satisfaction

The Genuine Walworth Stillson Wrench was the original pipe wrench. Walworth experts of the third generation are constantly and consistently seeking to improve its quality today, a pipe wrench to the average fitter means only the Genuine Walworth Stillson. The same in every detail that his grandfather used.

(2) Special Heat Treatment

The Genuine Walworth Stillson Wrench as now made is an evolution. The latest discoveries in metallurgy, heat treatment, etc., are being utilized to the end that highest quality is obtained. Every Genuine Walworth Stillson Wrench is subjected to a special and severe heat treatment.

(3) Strength

The effect of the heat treatment is to secure the maximum strength combined with toughness and "punishability."

(4) Universal Application

Not a luxury, but a necessity. Practically every house, factory or garage has piping of some kind whether steam, gas or water. Hence

n" Keys to Pipe Wrench Satisfaction

If a sudden leak arises a Genuine Walworth Stillson Wrench is desirable "first aid." No home complete without a Genuine Walworth Stillson Wrench. The Genuine Walworth Stillson Wrench will stop, start or fasten anything round, square or hexagon.

(5) Uniformity

Fifty years of experience manufacturing the Genuine Walworth Stillson has resulted in a uniform product. Every wrench is like every other wrench in every particular.

(6) Interchangeable Parts

Genuine Walworth Stillson Wrench parts are and have been interchangeable since the beginning of its manufacture. Wrench parts as made today are often supplied for wrenches made 30 to 40 years ago.

(7) Durability

Numerous instances are on record where three generations of steam fitters have used the *same* Genuine Walworth Stillson Wrench.

(8) Widespread Distribution

Easily obtained. The Genuine Walworth Stillson Wrench, due to the enviable history and satisfactory service, is carried in stock by thousands of dealers throughout this and other countries. It is obtainable from practically every dealer in hardware anywhere.

(9) Marking

The Genuine Walworth Stillson Wrench is marked with a diamond trade-mark as follows:

A wrench which is not thus marked is NOT a GENUINE WALWORTH STILLSON WRENCH. This mark protects the user.

Send for circular descriptive of Genuine Walworth "Stillson" Wrench. It will tell you a lot about wrenches—the Genuine Walworth "Stillson" Wrench in particular.

WALWORTH MFG. CO.

BOSTON

BRANCH STORES: Boston New York Chicago Seattle

WESTERN DIVISION: Office: Chicago, Ill. Works: Kewanee, Ill.

SALES OFFICES: San Francisco, Dallas, Johannesburg, Havana, Buenos Aires, Santiago, Sydney, London, Paris, Sao Paulo

RAPID SERVICE
ON
STEEL SHAPES

WE ARE PREPARED

To render rapid service on special steel mouldings, angles, channels and irregular shapes made to special requirements.

We have over 2,000 sets of rolls made for almost every conceivable requirement, such as required in the construction of Automobiles, Steel Cars, Steamships, Mechanical Appliances, Architectural Iron Work, etc. New dies made on short notice.

Send us your blue prints.

We also solicit your inquiries on special steel tubing made round or square.

The Empire Art Metal Co., Inc.

College Point, N. Y.

Foreign Trade

Our Foreign Department, through our Buenos Aires Branch and extensive banking connections throughout the World, has unexcelled facilities for the intelligent and efficient handling of your foreign banking business. Consult us regarding any foreign financial or trade transactions in which you are interested.

The First National Bank of Boston

Capital, Surplus, and Profits, $27,000,000
Resources - - Over $250,000,000

Branch at Buenos Aires, Argentina

Steel for Service

Taking 100 as a basis for a cast steel gear, a prominent gear cutter places his case hardened forged steel gears cut from Carnegie Blanks at 500.

Other large gear cutting concerns also use these blanks from which to make their highest grade gears.

They are formed from discs, sheared from rolled cylindrical blooms. They are forged by hydraulic pressure, then revolved by steam power and subjected to rolling and forging action simultaneously.

The same process is used in the manufacture of

Carnegie Rolled Steel Crane Wheels

also

Carnegie Rolled Steel Industrial Wheels

of various types and the result is products of great excellence.

These wheels are being used by manufacturers as rapidly as Carnegie Steel Company can produce them, but this fact in itself is not necessarily a proof of good quality being appreciated by users, since in times like these all mills that can produce equipment for use in the operation of industrial plants are generally crowded to capacity.

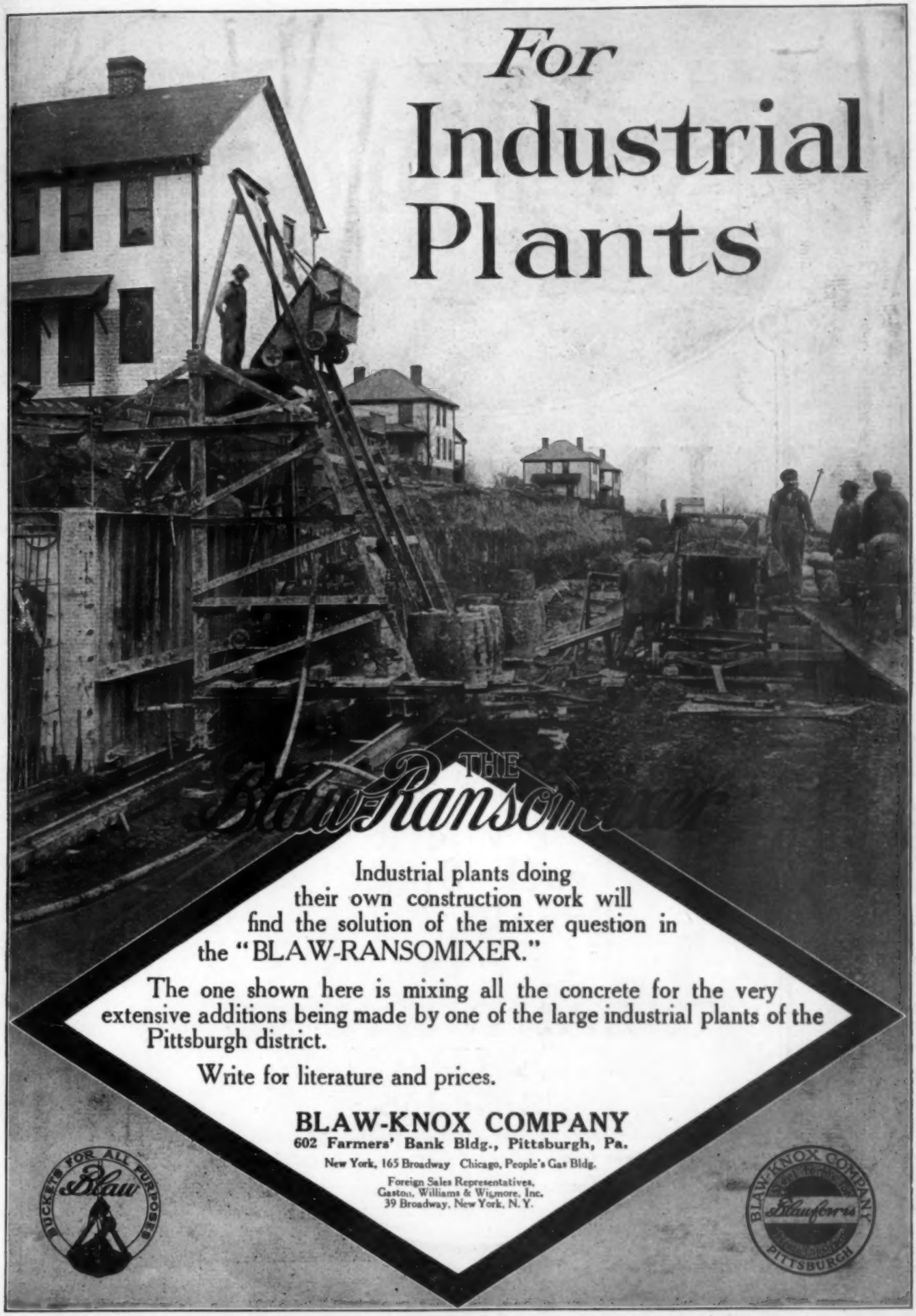
As far as possible, however, it should be the aim of all managers of such plants to select the very best equipment obtainable.

The best equipped plants in these emergency times will be the best at a later date when conditions are on a more normal basis.

Carnegie Steel Company

General Offices: Pittsburgh, Pa.

1159


For
Industrial
Plants
THE
Blaw-Ransom
Industrial plants doing
their own construction work will
find the solution of the mixer question in
the "BLAW-RANSOMIXER."
The one shown here is mixing all the concrete for the very extensive additions being made by one of the large industrial plants of the Pittsburgh district.
Write for literature and prices.
BLAW-KNOX COMPANY
602 Farmers' Bank Bldg., Pittsburgh, Pa.
New York, 165 Broadway Chicago, People's Gas Bldg.
Foreign Sales Representatives,
Gaston, Williams & Wigmore, Inc.
39 Broadway, New York, N. Y.
BUCKETS FOR ALL PURPOSES
Blaw
BLAW-KNOX COMPANY
Blawforms
PITTSBURGH

INLAND

BASIC OPEN HEARTH STEEL PRODUCTS

Billets :: Shapes
Plates :: Bars
Sheets
Roofing
Rivets
Track Spikes
Track Bolts
Tie Plates

INLAND STEEL COMPANY

Chicago

First National Bank Building

Works: Indiana Harbor, Ind. and Chicago Heights, Ill.

Branch Offices:
ST. LOUIS, ST. PAUL, MILWAUKEE,
DENVER, DALLAS

A NEW FACTOR

In order to manufacture satisfactorily any product, each step in its development must be vouched for by an authority in his line. Rather than depend upon foreign help, our policy of expansion has been to so equip ourselves as to control, through direct management, each step in the manufacture of

SHARON PRODUCTS

After several months of careful practice the Sharon quality stamp has been placed upon Mary Furnace, our latest addition, purchased from the Ohio Iron and Steel Co. By this purchase the pig iron used in the manufacture of Sharon Products is guaranteed as to quality, and thus these products have established a higher record of service than ever, because of their dependability, evenness of quality and elasticity of use.

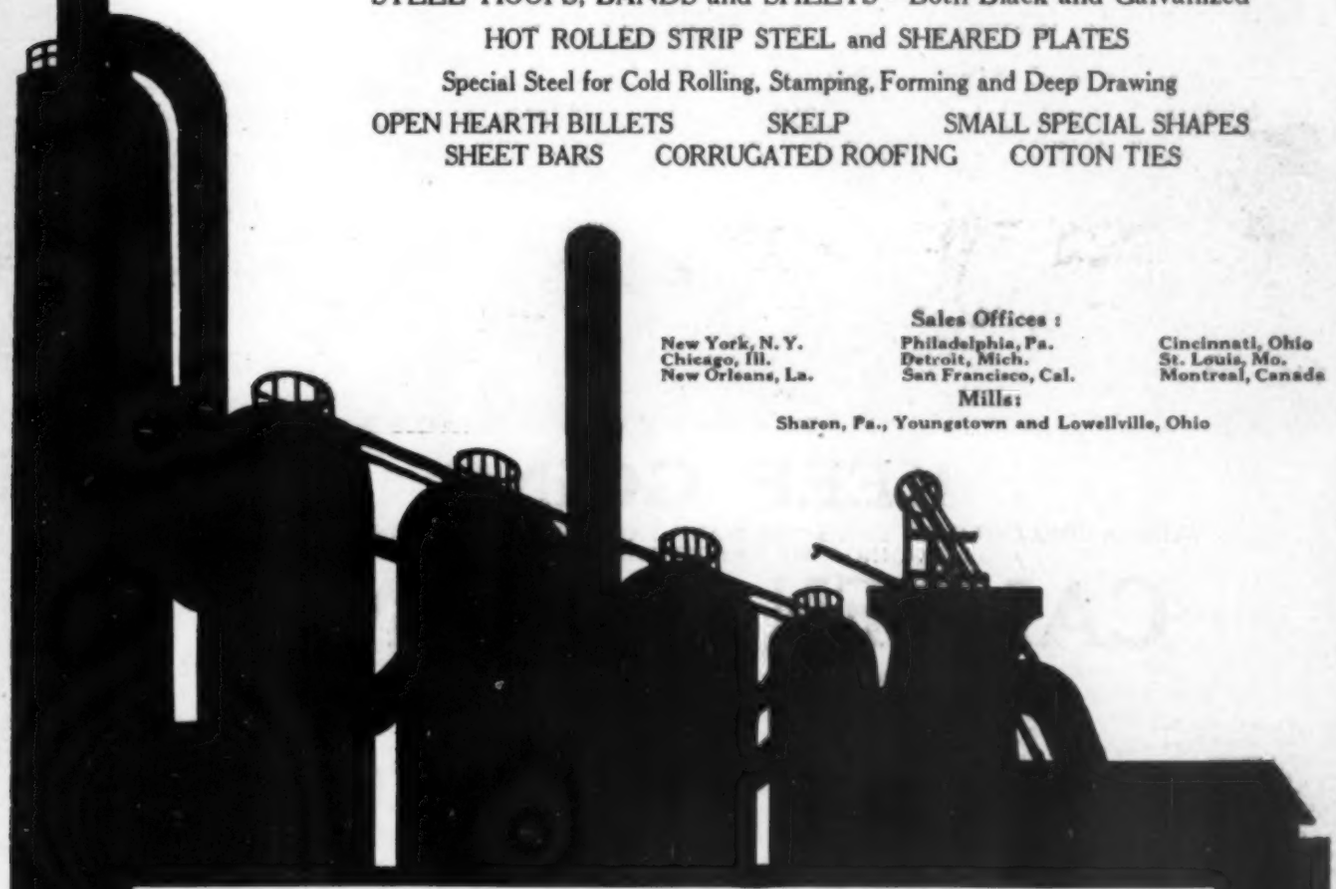
OUR PRODUCTS COVER:

STEEL HOOPS, BANDS and SHEETS—Both Black and Galvanized

HOT ROLLED STRIP STEEL and SHEARED PLATES

Special Steel for Cold Rolling, Stamping, Forming and Deep Drawing

OPEN HEARTH BILLETS SKELP SMALL SPECIAL SHAPES
SHEET BARS CORRUGATED ROOFING COTTON TIES



Sales Offices :

New York, N. Y. Philadelphia, Pa. Cincinnati, Ohio
Chicago, Ill. Detroit, Mich. St. Louis, Mo.
New Orleans, La. San Francisco, Cal. Montreal, Canada

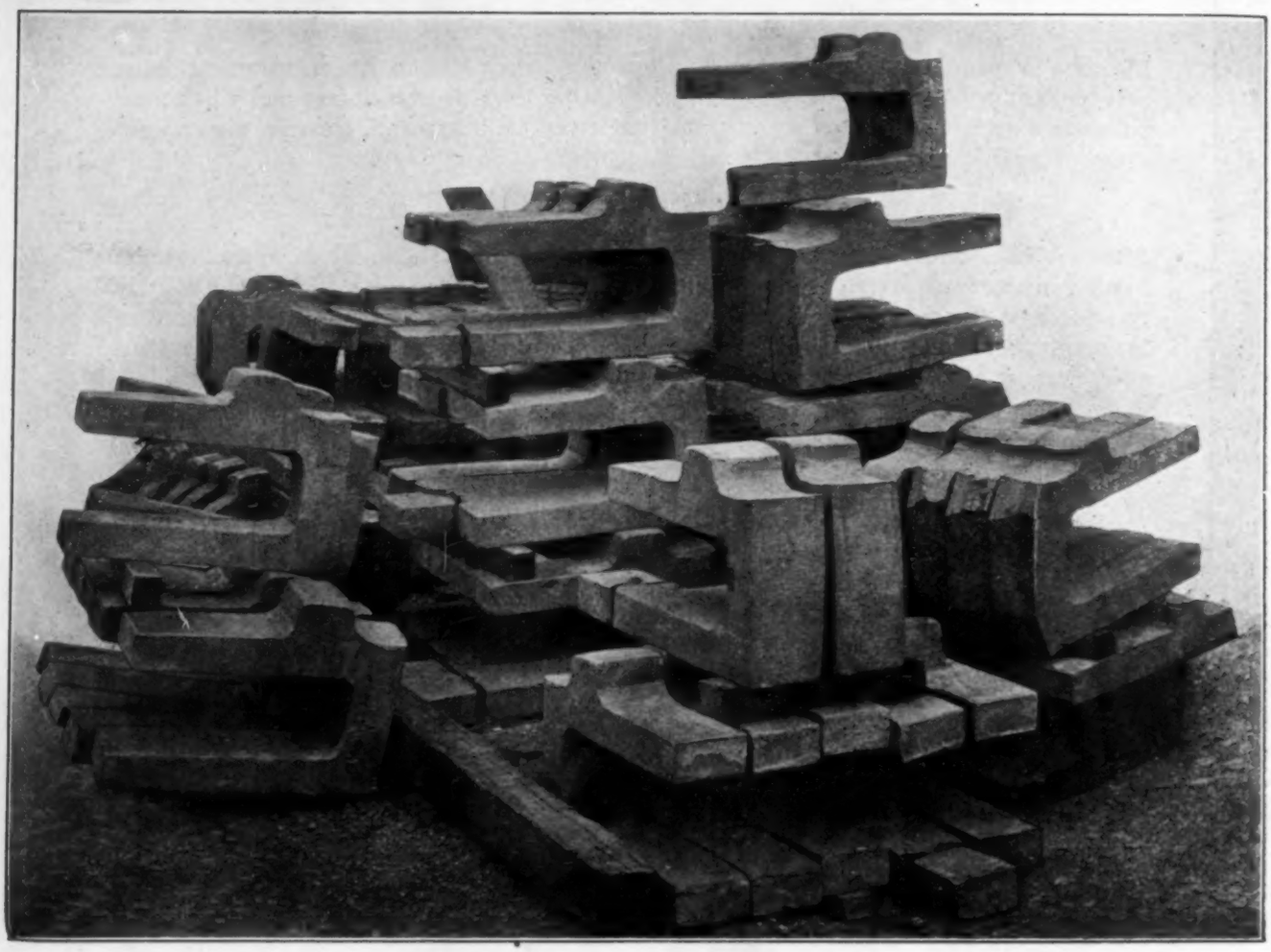
Mills:

Sharon, Pa., Youngstown and Lowellville, Ohio

Sharon Steel Hoop Co.

SHARON - - - - - PA.

CAMDEN



KEEP GOING

WHEN A CONCERN SAYS TO US "WE WANT THESE FORGINGS IN ORDER TO KEEP GOING," WE SAY TO THAT CONCERN

CAMDEN FORGINGS

ARE WHAT YOU WANT, LET CAMDEN KNOW

BUYERS' MEMO.

High and Low Carbon Bars
Press Columns and Rams
Pull Back Cylinders
Water Cylinders
Valve Bodies
Plungers
Weldless Steel Rings
Lathe Spindles, solid and hollow bored
Long Feed Screws
Power Press Crank Shafts

Cam Shafts
Eccentric Shafts
Crusher Shafts
Gear and Pinion Blanks
Locomotive: Side and Main Rods; Crank Pins; Axles; Rod Straps; Guides; Parts of frame both in iron and steel

Hammered Iron Bars for locomotive repairs
Marine Shaft
Marine Connecting and Eccentric Rods
Rolls: Bending; Feed; Straightening; *Embossing*
Large Wrenches
Saw Arbors

Steam Engine Forgings
Pump Crank Shafts
Pump Connecting Rods
Large Nuts
Turbine Shafts
Mill Shafting
Trolley Car Axles
Electric Motor Axles
Any forging to your print and specifications, in either iron or steel.

CAMDEN FORGE CO.
CAMDEN, N.J., U.S.A.

You May Have Become Accustomed

to thinking of us more particularly in connection with a limited number of specialties, overlooking the fact that the range of products which we manufacture is an extremely wide one.

For instance, consider the single item

DISCS

Under this heading are included several very different groups of products.

To begin with, there are the small light discs used for agricultural purposes. The Cambria Steel Company is a pioneer in the manufacture of concave and flat discs such as Plow Discs, Cutaway Discs, Harrow Discs and Drill Discs.

Then there are the heavy, forged and rolled discs, weighing one hundred pounds or more which are used for gears, turbine wheels and many other purposes.

Another type of disc is the tool steel disc made at our Nicetown Works from the very highest grades of Midvale carbon and high speed steel and used for milling cutters, etc.

Our nearest District Office can give you full information about these and other products.

MIDVALE STEEL AND ORDNANCE COMPANY
CAMBRIA STEEL COMPANY

General Sales Office: WIDENER BUILDING, PHILADELPHIA

DISTRICT SALES OFFICES:

Atlanta Chicago Cleveland New York Pittsburgh Salt Lake City St. Louis
Boston Cincinnati Detroit Philadelphia San Francisco Seattle

"We Want You to Become Better Acquainted With Us" Series No. 69-C

BETHLEHEM STEEL COMPANY

SOUTH BETHLEHEM, PENNSYLVANIA

PIG IRON: Basic, Bessemer, Foundry, Low Phosphorus, Mayari, Ferro-Manganese, Spiegeleisen.

CASTINGS: Steel and Iron, Brass, Bronze and Manganese.

FORGINGS: Drop, Hammered, Hydraulically Pressed, Solid and Hollow, Rough, and Finished Machine; Cement Mill and Ore Crusher Balls.

RAILS: Standard, Girder, Guard, High Tee, Industrial; Splice Bars, Tie Plates, Bolts, Frogs, Switches, Signals.

SWITCH STANDS: To Meet Every Track Condition; High, Intermediate and Low Stands, Adjustable and non-Adjustable.

MANARD ANVIL-FACE FROGS: Equipped with "Mayari" Never-Turn Bolts. All Bolts Receiving Side Thrust of Wheels are HEAT TREATED.

STRUCTURAL STEEL SHAPES: Bethlehem Beams, Girders and Columns; Standard Beams, Channels and Angles.

TOOL STEELS: Carbon, High Speed, Drill, Finishing and Special.

STANDARD ALLOY AND SPECIAL STEELS: Chrome Nickel, Chrome-Vanadium, Mayari, Case Hardened, Special; Treated, Tempered and Cold Drawn.

TIN PLATES: Black and Tinned plates, Stamping and Enameling Stock.

BAR IRON: Refined Bar Iron, Double Refined, Chain, Staybolt, Special Staybolt, and Engine Bolt Iron.

BOLTS: All kinds, Plain and Galvanized, Machine, Carriage, Lag, Plow and Patch; HEAT TREATED Simple Alloy Mayari Steel Frog, Track and Fitting-up Bolts.

NUTS: Hot and Cold Pressed, Cold Punched and Forged, all Sizes, and Shapes and Standards, Blank and Tapped, Chamfered, Trimmed and Reamed, Case Hardened, Castle, Semi-Finished and Finished.

RIVETS: Boiler, Bridge, Structural, Ship, Tank and Tap.

SPIKES: Steel and Iron, Standard Railroad, Screw Railroad Track, Universal Screw, Boat, Dock and Wharf, Pressed and Rolled.

ENGINEERS AND BUILDERS OF SPECIAL MACHINERY
FORGINGS and CASTINGS FOR LARGE MARINE ENGINES
Hydraulic Beam and Gap Shears, Plate Bending Rolls, Intensifiers, Flanging and Forging Presses.
FURNACE and FOUNDRY COKE and COKE BY-PRODUCTS
Ammonium Sulphate, Benzol, Crude Naphthaline, Solvent Naphthas, Toluol, Tar.
PUMPING ENGINES FOR MUNICIPAL PURPOSES, GAS ENGINES.
NAVAL and COAST DEFENCE GUNS and MOUNTS, FIELD GUNS and HOWITZERS
GUN CARRIAGES, LIMBERS and CAISSONS, GUN FORGINGS, TORPEDO AIR FLASKS, ARMOR PLATE, PROJECTILES, FUSES, CARTRIDGE CASES, COMPLETE ROUNDS OF AMMUNITION.

WORKS AT:

South Bethlehem, Pa., Lebanon, Pa., Reading, Pa., Steelton, Pa.
Titusville, Pa., Sparrows Point, Md.

WAREHOUSES AT:

South Bethlehem, Pa. Lebanon, Pa. Boston, Mass. Cleveland, Ohio

GENERAL OFFICES: South Bethlehem, Pennsylvania

BRANCH OFFICES:

ATLANTA, GA., - - Candler Building
BALTIMORE, MD., - Continental Building
BOSTON, MASS., - - - Oliver Building
CHICAGO, ILL., - - People's Gas Building
CLEVELAND, O., - - Guardian Building
DETROIT, MICH., - Penobscot Building
25 Victoria Street - LONDON, S. W. ENGLAND
Santiago, - - - - - - - CHILE

NEW YORK, N. Y. - - Trinity Building
PHILADELPHIA, PA., - - Morris Building
PITTSBURGH, PA., - First Nat'l Bank Building
ST. LOUIS, MO., - Boatsmen's Bank Building
SAN FRANCISCO, CAL., - Crocker Building
WASHINGTON, D. C. - - Wilkins Building
Rio De Janeiro, - - - - - BRAZIL
Lima, - - - - - - - - PERU

Service

Few organizations exist that never have run short of supplies. Realizing the importance of prompt action in these emergency cases, we have established Novo Superior Steel service stations at convenient points thruout America's manufacturing districts. Our warehouses at New York, Boston, Chicago, Cleveland, Montreal and San Francisco are prepared to make prompt shipment of any current sizes.

Write or wire your requirements.
Stock List upon request.

H. BOKER & CO., Inc.

Established 1837

101 Duane St., New York City

Chicago Boston Cleveland Philadelphia Montreal

Pacific Coast Representatives:
Berger & Carter Co., Pacific Tool & Supply Div.,
400 Mission Street, San Francisco, Cal.

PIONEER PIG IRON

Even while pouring "Republic" Pioneer Brand Pig Iron, it begins to show its quality which becomes more and more evident as it emerges into the finished article.

Try it as a means of acquiring greater prestige for your products.

BESSEMER STEEL OPEN HEARTH

Merchant Bars; Sheet Bars; Billets; Blooms; Slabs; Skelp; Bar Iron; Old Rail Bars; Round Polished Steel Shafting; Sheared Plates; Railroad Spikes; Turnbuckles; Nuts; Washers; Bolts.

REPUBLIC PIPE

Standard, Black and Galvanized.

Line Pipe; Drive Pipe; Tubing and Casing.

The sooner you use "Republic" Pipe the sooner you'll regret not having used it long ago.

REPUBLIC IRON & STEEL COMPANY

General Offices: Republic Bldg., Youngstown, Ohio

SALES OFFICES:

BIRMINGHAM	CHICAGO	DALLAS	PHILADELPHIA
BOSTON	CINCINNATI	DETROIT	PITTSBURG
BUFFALO	CLEVELAND	NEW YORK	ST. LOUIS
	SAN FRANCISCO		

TITANIUM TALKS

No. 34

Three heats of Steel for Galvanized Sheets were divided by tapping into two ladles. A portion of each heat was given the regular Open Hearth Department practice, and to the other part was added three pounds of Ferro Carbon-Titanium per ton of Steel.

The results were as follows:

	Titanium Treated Portion	Untreated Portion
Wt. of Ingots Cast	149,900 lbs.	152,400 lbs.
Percentage of Losses:		
Ingots to Sl	22.99%	26.07%
Iron in P	1.12%	2.32%
Number of Sheets Galvanized	7,469	7,250
Grading Percentages:		
Large Spangles	82.87%	12.59%
Medium Spangles	14.88%	44.39%
Small Spangles		22.63%
Dull Granular Spangles		6.90%
Blisters	0.97%	4.98%
Seams		2.02%
Laminations		4.43%
Dirt in Steel		0.00%
Hot Roll Marks	1.28%	2.06%
	100.00%	100.00%

This improvement cost 40c per ton of Sheets produced.

The Titanium Alloy Mfg. Company

Niagara Falls, New York

Pittsburgh Office. Oliver Building
New York Office, 165 Broadway

FERRO CARBON TITANIUM F.C.T.

Chicago Office, Peoples Gas Building
T. Rowlands & Co., Sheffield, England

Agents for Great Britain and Europe

Picking the right kind of tool steel by the aid of the new LUDLUM text-book

Costly tools must be made of the right steel or they are useless. We have **compiled** and published at great expense a complete **book** on this subject—**160 pages.**

Do you wish to know the effect of alloys in steel—the correct method of forging, hardening, tempering, annealing?

Have you use for accurate calculation tables and much valuable information?

We will send you a copy gratis on request, to a buyer or user of tool steel

MOHAWK EXTRA
HIGH SPEED STEEL

POMPTON
CARBON TOOL STEEL

ALBANY
ALLOY TOOL STEEL

ONEIDA
OIL HARDENING TOOL STEEL

HURON
ALLOY DIE STEEL

TETON
BALL BEARING STEEL

YUMA
CHROME MAGNET STEEL

LUDLUM STEEL COMPANY

General Offices and Works
WATERVLIET, N. Y.

"We know what masters laid thy keel!"

—masters of design—masters of the patternshop, of the foundry, the rolling mill, the drill press, the riveting hammer and the machine tool. These masters of production who are building the "ships of democracy", building at a speed never before known in the history of the world, owe much of their success to the wonderful achievements of *high speed steel*—the steel that has made possible the creation of the wonderful machines of production.

"Electrite" Uranium is more than *high speed steel;* it is the *"highest" speed steel—high speed steel—plus.*

Write for sample.

LATROBE ELECTRIC STEEL CO.

LATROBE, PENNSYLVANIA

Sales Offices:

New York, 165 Broadway
Pittsburgh, Pa., First National Bank Bldg.
Cincinnati, Ohio, 2802 Union Central Bldg.
Detroit, Mich., 1531 Dime Bank Bldg.
Toledo, Ohio, 248 Water Street
Oil City, Pa., 557 Chambers Bldg.
Erie, Pa., 15th and Ash Streets
Buffalo, N. Y., 512 Ellicott Square Bldg.
Cleveland, Ohio, Union National Bank Bldg.
Seattle, Wash., 536 First Ave., South
Los Angeles, Cal., American Bank Bldg.
San Francisco, Cal., 149 California Street
Dayton, Ohio, 1105 Conover Bldg.
Philadelphia, Pa., Widener Bldg.
Washington, D. C., Riggs Bldg.
Winnipeg, Can., 307 Confederation Life Bldg.
Chicago, Ills., 572 West Randolph Street
St. Louis, Mo., 810 Security Bldg.

We Manufacture Electric Furnace Steel Exclusively

"Red Cut Superior"

HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment, tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in **"Red Cut Superior"**, a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs, and Treated Tool Holder Bits.

Are your tools made of **Red Cut**?

Send for folder

VANADIUM-ALLOYS STEEL COMPANY

Pittsburgh, Pa.

Works at Latrobe, Pa.

The Matthew Addy Company

FOUNDED 1859 ADDY INCORPORATED 1915

Write our nearest office

CINCINNATI PHILADELPHIA
ST. LOUIS CHICAGO

We expect our customers to close all their accounts with us by Trade Acceptances.

We on our part are equally willing to give Trade Acceptances.

PIG IRON COKE COAL

Colonial High Speed Steel

Copyright by Committee on Public Information, from Underwood & Underwood, N. Y.

Ship Building Speed Is "Colonial" Speed!

There is no work too rapid for "Colonial." On the job that requires fast cutting—deep, true and smooth—this extra quality steel will put it right through to completion.

Colonial High Speed Steel

is made in a way that assures absolute uniformity. It puts into this steel toughness and strength, and a power for fast accurate cutting.

Colonial Steel Company

PITTSBURGH NEW YORK DETROIT BOSTON
ST. LOUIS PHILADELPHIA CHICAGO

Tennessee Coal, Iron & Railroad Company

PIG IRON
FOUNDRY—FORGE—BASIC
"DeBardeleben," "Eureka," "South Pittsburgh," "Ensley," "Alice."

OPEN HEARTH STEEL
Rails, Blooms, Billets, Slabs, Bars
Twisted Squares, Sheared Plates, Angles

TENNESSEE SPECIAL TOOL STEEL
Rounds, Squares, Octagons and Flats

COAL
Steam—Gas—Blacksmith
Domestic

COKE
Furnace—Foundry
Domestic

GENERAL OFFICES: Brown-Marx Building, Birmingham, Alabama

BRANCH OFFICES

Boston	Buffalo	Chicago	Cincinnati	Cleveland
Denver	Detroit	New Orleans	New York	Philadelphia
	Pittsburgh	St. Louis	St. Paul	

Pacific Coast Representatives: United States Steel Products Company, San Francisco, Seattle, Portland, Los Angeles
Export Representatives: United States Steel Products Company, New York City

"Franklin"
STEEL
for Concrete Reinforcing

Where Quality Joins Service!

QUALITY without SERVICE is quite as useless as SERVICE without QUALITY. The COMBINATION is what you want and this is what we have to offer.

Steel especially well adapted for reinforcing work and quick, accurate service.

We not only have the equipment and organization for putting your orders through our mills promptly, but in addition to this we assist you, in as far as we possibly can, in getting the steel transported quickly from our MILLS to your WORKS.

If you have a contract and want a lump sum bid, we are prepared to submit figures for all the reinforcing steel required, the bars sheared to lengths, bent to specifications, delivered on the job ready for the forms.

If you want any assistance in designing your reinforcing, our ENGINEERING DEPARTMENT will co-operate with you.

FRANKLIN STEEL WORKS
FRANKLIN - - PA

CLEVELAND - 1320 Rockefeller Building
BOSTON - 12 Pearl St.
PHILADELPHIA - 2215 Race St.
NEW YORK - 30 Church St
CHICAGO - 332 South Michigan Ave.
BUFFALO - Erie County Bank Building

NEW YORK BOSTON DALLAS SAN FRANCISCO

ALAN WOOD IRON & STEEL CO. ESTABLISHED 1826 A.W. TRADE MARK PHILADELPHIA

Manufacturers of

O. H. FORGING BILLETS

MADE TO

SPECIAL ANALYSES

Acid Open Hearth

Forging Ingots

Chill or Sand Cast

Plain or Alloy Steel

For Prompt Delivery

Let us quote on your requirements

The McConway & Torley Co.

Arsenal Station, Pittsburgh, Pa.

ACCOMPLISHMENT

KNOWLEDGE of the foreign buyer's Iron and Steel Requirements—
SERVICE, relieving him of every detail incident to manufacture, shipment and insurance—
SPEED, made possible by our unusual facilities—

—— These are integral parts of every "VULCAN" Accomplishment.

Vulcan Steel Products Co.

120 Broadway New York

Your every requirement becomes a "VULCAN" obligation.

STRUCTURAL MATERIAL - COMPLETE STOCK
PROMPT SHIPMENT

BELMONT IRON WORKS

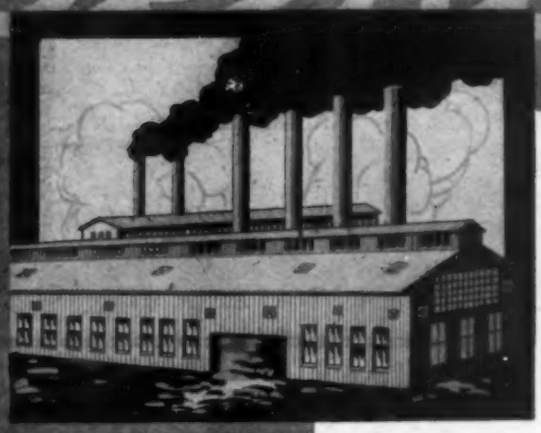
ECONOMICAL DESIGNS FOR STEEL BUILDINGS - FABRICATION - ERECTION

N. Y. Office
32 BROADWAY

Main Offices and Works:
PHILADELPHIA, PA.

Bridge Shops
EDDYSTONE, PA.

"Genuine Open Hearth Iron"



Great reserve supplies of munitions and materials are protected by

"Genuine Open Hearth Iron"

"GENUINE OPEN HEARTH IRON" is the best possible protection against wear, weather and time. For the new or for the old building it will demonstrate its wonderful lasting qualities.

"GENUINE OPEN HEARTH IRON" cannot be equaled for roofing, siding, gutters, cornice, eaves trough, conductor pipe, skylights, ventilators, tanks, stacks, window frames, doors, ridge rolls, flashings, etc.

If your jobber cannot supply you, write us direct.

Newport Rolling Mill Co., Newport, Ky.

FORGING BILLETS

SPECIAL ALLOY STEEL

CHROME -:- NICKEL
CHROME VANADIUM
CHROME NICKEL
and

Special Steel for All Purposes

PROMPT SHIPMENT FROM STOCK

WRITE FOR MONTHLY STOCK LIST

The Andrews Steel Company
INCORPORATED

NEWPORT, KY., U. S. A.

DISTRICT SALES OFFICES

1419 Park Bldg., Pittsburg — Security Bldg., St. Louis — 1515 McCormick Bldg., Chicago

McCLINTIC-MARSHALL COMPANY

PITTSBURGH, PA.

STEEL BRIDGES AND BUILDINGS

LARGEST INDEPENDENT MANUFACTURERS AND ERECTORS

PHILADELPHIA
WASHINGTON
POTTSTOWN
NEW YORK
DETROIT
BOSTON
CHICAGO
SYRACUSE
CINCINNATI
SAN FRANCISCO

WORKS:
PITTSBURGH
POTTSTOWN
CARNEGIE
LEETSDALE

RITER-CONLEY COMPANY

PITTSBURGH, PA.

TANKS GAS HOLDERS BLAST FURNACES
OIL REFINERIES TRANSMISSION TOWERS, ETC.
LARGEST PLATE WORKS

Edmund W. Mudge & Company

Frick Building PITTSBURGH, PA.

STANDARD BASIC AND BESSEMER PIG IRON

BASIC OPEN HEARTH AND BESSEMER STEEL BILLETS SLABS AND SHEET BARS

FURNACE AND FOUNDRY COKE, COAL FOR BY-PRODUCT AND PRODUCER GAS USERS

Own and Operate

CLAIRE FURNACE COMPANY
Sharpsville, Pa.

ELLA FURNACE COMPANY
West Middlesex, Pa.

WESTMORELAND CONNELLSVILLE COAL & COKE COMPANY

RELIANCE COKE COMPANY

JONES & LAUGHLIN STEEL COMPANY

Manufacturers of

VARIOUS

STEEL PRODUCTS

Branch Offices:

Boston	Cincinnati	New York
Buffalo	Cleveland	Philadelphia
Chicago	Detroit	San Francisco
	St. Louis	

Works:

South Side Works — Keystone Works
Soho Department — Aliquippa Works
Eliza Furnaces & Coke Ovens

General Offices:

Jones & Laughlin Building
PITTSBURGH

122

From New York to Chicago, from Cincinnati to Detroit

UNION DRAWN SERVICE AND QUALITY

reaches out to serve you with the products of the world's largest bright finished steel plant.

Our unequaled warehouse service at New York, Philadelphia, Cincinnati, Detroit and Chicago, enables us to ship your orders on short notice, for anything in Bessemer, Openhearth, Nickel, Chrome and Vanadium Steel, Cold Drawn Shafting, Elevator Guides, Screw Stock, Rounds, Flats, Squares and Hexagons.

UNION DRAWN STEEL CO., Main Office and Works Beaver Falls, Pa.

Offices and Warehouses—New York, 460-466 Washington St. Philadelphia, Ninth and Willow Sts. Cincinnati, Spring Grove Ave. Chicago, 570 West Adams St. Detroit, 69 Jos. Campau Ave. Boston, 95 Milk St. Buffalo, White Building

Electric Steel

Plain Carbon and Alloy Forging Ingots

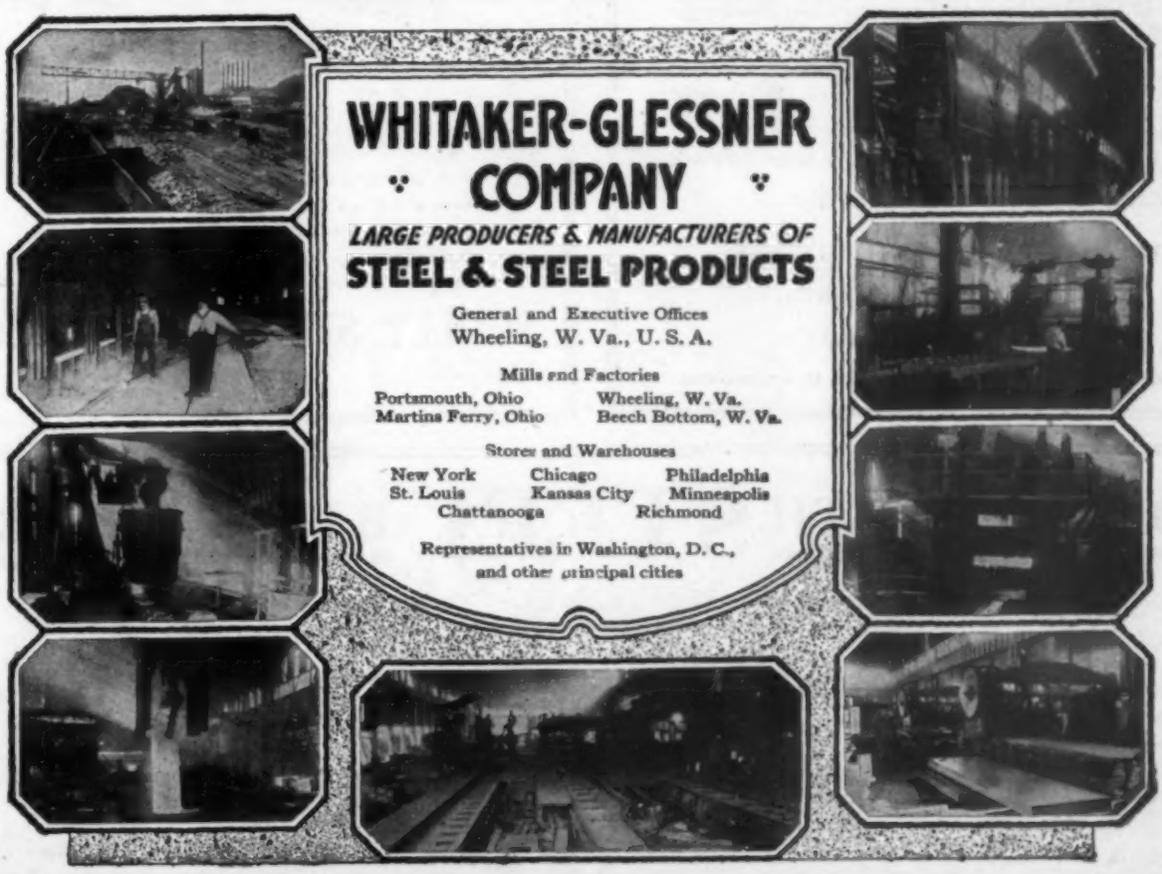
CORRUGATED ROUND SECTIONS

14" 16" 18"
24" 28" 35"

PROMPT DELIVERY ON
ANY SIZE

GENERAL STEEL COMPANY

PUBLIC SERVICE BUILDING MILWAUKEE, WIS.



NAGLE STEEL COMPANY

STEEL PLATES

Open Hearth Steel Furnaces:
Rahway, N. J.

Plate Mills:
Glasgow, Montgomery Co., Pa.
Pottstown, Pa.
Seyfert, Pa.

General Office:
POTTSTOWN, PA.

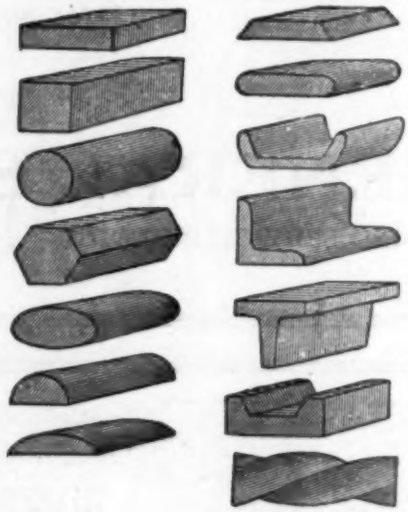
Immediate Shipment
from Stocks at
Chicago, St. Louis and St. Paul

BEAMS, Structural
CHANNELS, Structural and Small
ANGLES, Structural and Small
TEES, Structural and Small
ZEES, Structural
COLUMN H-SECTIONS
PLATES, U. M. Sheared and Checkered
ROUNDS, Mild, Forging, Free Cutting Hammer, Drift Pin, Cold Drawn Screw Stock, Nickel, Chromium Nickel, Polished Shafting and Rivet
SQUARES, Mild Forging, Cold Twisted and Cold Drawn Screw Stock
FLATS, Mild, Forging and Cold Drawn Screw Stock
BANDS, Scrolled and Straight Lengths
HEXAGONS, Cold Drawn Screw Stock
SHEETS, Blue Annealed and American Bessemer
SHEET PILING, U. S. Steel
BARK RACK BARS, Double Bevel
RAILS, Heavy and Light
RAIL FITTINGS, Splices, Track Bolts and Spikes
FORGING BILLETS
RIVETS, Structural, Cone Head, Countersunk and Draw Bar Yoke
BOLTS, Machine, Bolt and Rod Blanks

ADDRESS
Warehouse Dept., Illinois Steel Company
CHICAGO, ILL.
Illinois Steel Warehouse Co.
ST. LOUIS, MO.
Illinois Steel Warehouse Co.
ST. PAUL, MINN.

Stock List will be mailed regularly to those interested

BARS IN STOCK



Have all above shapes in Standard Steel Bars, also have first four shapes in Cold Rolled Steel, and first three in Common Iron. We solicit your inquiries for these Bars and other steel products we handle. See our Stock List.

SCULLY STEEL & IRON CO.
CHICAGO NEW YORK

OPEN HEARTH STEEL BESSEMER

MERCHANT BARS, SHAPES, RAILS, TWISTED SQUARES,
MILL AND WAREHOUSE STOCK SHIPMENTS

WHEN DELIVERY FAILS TRY US
"SERVICE OUR STRENGTH"

STEEL INDUSTRIES CORPORATION

Branch:
67 Milk St., Boston

GENERAL OFFICES:
261 BROADWAY, NEW YORK, N. Y.

Phones {9136 / 9137} Barclay

BM

OPEN HEARTH STEEL

BM

A CAPACITY OF

100 TONS PER DAY

Available for **Immediate Shipment,** made up in Ingots to suit your requirements and analysis to your specifications.

WIRE US YOUR NEEDS

BRADDOCK MANUFACTURING CO.

BM

ENGINEERS—MACHINISTS
AND STEEL MAKERS
Braddock, Pa.

BM

QUALITY D STEEL

PLATES
•
BLOOMS
•
ANGLES
•
CAR AXLES
•
DRIVING AXLES

BILLETS
•
SLABS
•
BARS
•
SPECIAL SHAPES
•
"NIAGARA" FOUNDRY IRON

General Offices and Works BUFFALO, N. Y.
DONNER STEEL COMPANY, Inc.
District Sales Offices: Munsey Bldg., PHILADELPHIA, PA. 120 Broadway, NEW YORK CITY

Ingot Moulds—

Ingot Moulds have to undergo unusually severe treatment. Our original methods of making them, together with the use of an iron made especially for Ingot Moulds, naturally increases the service of our Moulds. Our representative calls frequently at your plant to keep us in close touch with your operation and needs.

Established 1892

Besides being the *original*, we are the *largest* manufacturers of moulds in the country.

Our capacity is 38,000 tons a month.

We Offer You Both Quality and Service—

We have eight blast furnaces—four of which are under long time contract—available for our supply of molten metal. Besides this we have our own blast furnace of 9,300 ton capacity, which we keep in reserve for emergency purposes.

You can rely on us at all times. This means much in the hour of need.

If you are not using "Valley" Ingot Moulds you'd better drop us a line now, and get acquainted.

Valley Mould and Iron Corporation

SHARPSVILLE, PA.

"Penn" for QUALITY Molds that Last Longer

INGOT MOLDS

C. E. BLUE . . . Pres.
H. S. BRADLEY, Vice Pres.
H. S. SANDS . . Treas.
W. V. HOGE . Gen'l Mgr.

The Penn Mold & Mfg. Co.

Works, Dover, Ohio
Gen'l Offices, Wheeling, W. Va.

—two bits are better than a ton of scrap, as far as production is concerned

Send us your High Speed scrap and we'll return you pound for pound, of "ON" High Speed Steel.

HIGH ON SPEED

TRADE MARK

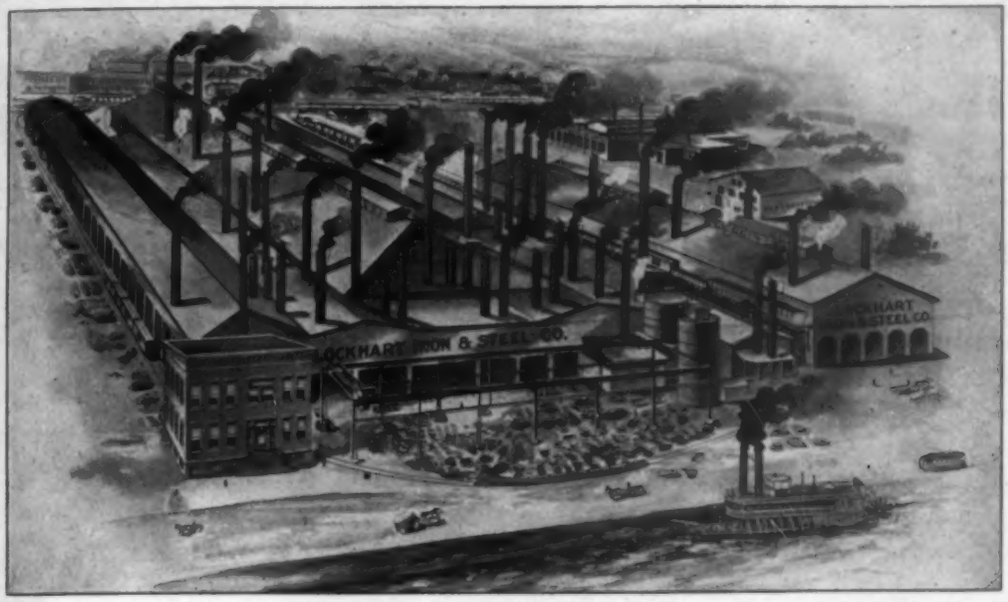
We guarantee "ON" High Speed Steel converted for you to be equal in quality to any High Speed Steel you ever used.

Let us hear from you.

Onondaga Steel Company

—Incorporated—

SYRACUSE, NEW YORK



Our Brands:

REFINED
for ordinary uses.

VULCAN
for special purposes.

Vulcan Special
for engine bolts.

VULCAN XX
for locomotive stay bolts.

To wholly preserve the high standard of quality that has always been recognized in ***Vulcan Iron*** we still adhere to the old-fashioned method of puddling.

Vulcan Iron is made by the ***quality*** process, not the ***quantity*** process.

ALLEGHENY STEEL
AND
ALLEGHENY IRON

SHEETS
PLATES
BOILER TUBES
STEEL CASTINGS
WASHERS

Allegheny Steel Company, Pittsburgh, Pa.

SOLICITING AGENTS
New York Philadelphia Chicago Detroit

SPECIAL
DEEP DRAWING
STEEL SHEETS

HOT AND COLD
PRESSED STAMPINGS

"PITTSBURGH PERFECT" OPEN HEARTH
STEEL AND WIRE PRODUCTS

WIRE—Galvanized, Bright, Annealed
NAILS BARBED WIRE BALE TIES
WIRE FENCING—Electrically Welded
HOOPS BANDS COTTON TIES
PIG IRON BILLETS

Manufactured By
PITTSBURGH STEEL COMPANY
PITTSBURGH, PA.

New York Washington Chicago Duluth
San Francisco Memphis Dallas
EXPORT DEPT., Equitable Bldg., NEW YORK, U. S. A.

STRIP STEEL OF QUALITY

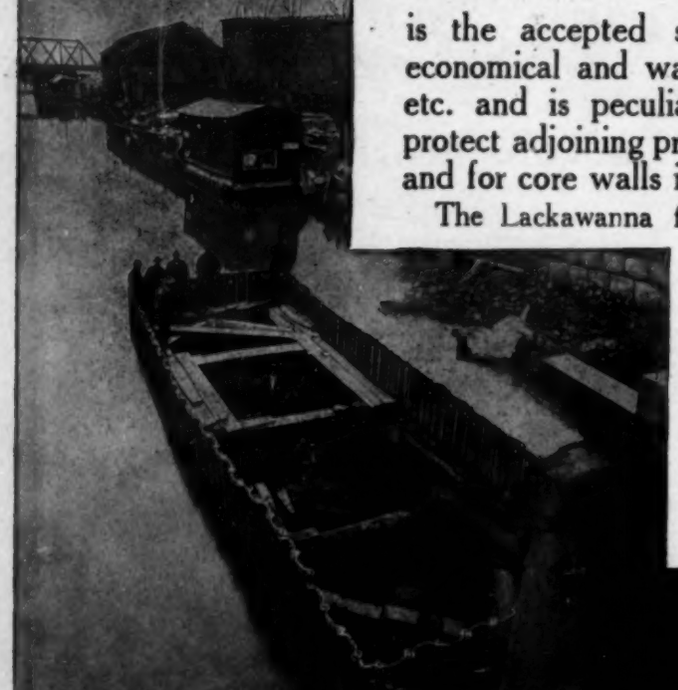
SHOULDER to shoulder in the upward march to a higher civilization walks the man ***who carries the musket and he whose broad shoulders support the load of increased industrial production.***

Standard Analysis and Alloy Steels
Rolled from 3" to 24".
Reliable gauge 16 to 00.

The National Pressed Steel Co.
"Rollers of Strip Steel"
Massillon, Ohio

District Representatives:
Chicago, Ill.: Hoyt-Noe Steel Co., Washington Blvd. and Green St.
Detroit: F. Walter Guibert, 326 Ford Bldg.
New York City: Josef F. A. Comstedt, Equitable Bldg., 120 Broadway.
Philadelphia: John W. Moon, 1420 Chestnut St.

Lackawanna Steel Sheet Piling



is the accepted standard material for safe, quick, economical and watertight foundations, piers, sewers, etc. and is peculiarly suitable for retaining walls to protect adjoining property, for dock walls, curtain walls and for core walls in levees and dams.

The Lackawanna flexible interlock is not only superior in strength and watertightness, but permits obstructions in the piling line to be passed without undue deflection, and is adapted to the construction of small circular or irregular enclosures.

Types and sizes to meet all service requirements are described in our book *"Lackawanna Steel Sheet Piling"* which will be sent on request. 316

Lackawanna Steel Company
LACKAWANNA, N. Y.
ATLANTA BUFFALO CINCINNATI DETROIT PHILADELPHIA SAN FRANCISCO
BOSTON CHICAGO CLEVELAND NEW YORK ST. LOUIS HAVANA

Quality

Service

PLATE AND JOBBING MILL
COMPLETED NOVEMBER 15, 1918.

PLATES

Ship Plates—Tank Plates—Boiler Plates. Sheared Plates for all purposes 7/64 to 2 inches thick—Extreme Width 120 inches.

SHEETS

Blue Annealed—1/4 inch to 16 Gauge. Black Sheets—7 Gauge to 30 Gauge. Galvanized Sheets—10 Gauge to 30 Gauge Special Finishes for particular uses—Auto Stock—Furniture Stock—Deep Drawing Stock, Etc.

ROLLED FROM BRIERHILL STEEL

THE BRIER HILL STEEL COMPANY

YOUNGSTOWN, OHIO

THE STANLEY WORKS NEW BRITAIN, CONN.
NEW YORK CHICAGO

Instead of castings use
Crosman Stamped Parts

All classes of **High Grade Sheet Metal Stampings, Difficult Metal Drawings** and Die Designing.

Let us figure on your requirements.

THE CROSMAN STAMPING CO.
YPSILANTI, MICH.

Forged Rings and Bands

"Forgings That Stand the Test"

Gear Ring Blanks, Core Ring Blanks, Sprocket Blanks, etc.

Every piece is guaranteed true to circumference and flatness.

THE AKRON-SELLE CO., AKRON, O.

STRIP STEEL

By controlling our own Open Hearth Furnaces, Forging Hammers and Hot and Cold Rolling Mills, we are able to supply you with the very highest grade strip steel that it is possible to make.

QUALITY FIRST is our slogan.

If you wish utmost satisfaction, let us fill your next requirements.

WEST LEECHBURG STEEL COMPANY
Gen. Sales Office PITTSBURG, PA. Works LEECHBURG, PA.
SALES OFFICES
NEW YORK DETROIT CHICAGO TOLEDO

Automobile Sheets

Deep Drawing and Extra Deep Drawing Auto Body Stock. Deep Drawing and Extra Deep Drawing Crown Fender Stock. Hood Stock.

Prompt Service

The Mansfield Sheet & Tin Plate Company
Mansfield, Ohio

SENECA SHEETS

One Pass Black Steel
Single Pickled One Pass
Three Pass Stock for Japanning

The brand that stands for Quality
Our range in flat sheets is not over 42" wide and 144" long.

Enameling Finish for Enameled Products

Black and Painted Roofing 2½" and 1¼" Gauges, No. 14 to No. 28. Any length not over 12 feet.

Seneca Iron & Steel Co. **Buffalo, N. Y.**

The "New Britain"
All-Steel Bench Drawer
A Light Drawer that's Unbreakable And Safe from Sneak Thieves

This is a most desirable drawer in every way for those whose requirements do not demand the wooden back, bottom and front of our "Frictionless Type."

A hem of triple thickness around the upper edge and the welding of all joints insures unusual strength and durability. The slide ways are integral with the top and give the drawer a smooth, free movement, without tendency to bind.

A solid sheet metal top prevents the possibility of pilfering from the rear, as it leaves no open space such as is found between the back plank and the ordinary type of drawer. It also prevents blocking or a lockout through wedging of contents, and it excludes any water or oil that might accidentlly soak through from above.

The drawer itself is a solid unit, requires no fitting, and is easily and quickly installed without cutting the bench. Provided with a good cylinder lock and two individual keys. Master keying, if desired, may be had at cost.

The price of this safe, handy, unbreakable drawer is very moderate for the high degree of satisfaction the user gets out of it.

Write for illustrated folder No. 1202-A

The New Britain Machine Company
"Shop Furniture Originators" New Britain, Conn. U.S.A.

NATIONAL CRAYONS

Genuine Talc, Strong, Serviceable, Easy Marking.

The Ideal Crayon for Steel Mills and Factories.

Samples Free.

National Products Co.
East Liverpool, Ohio.

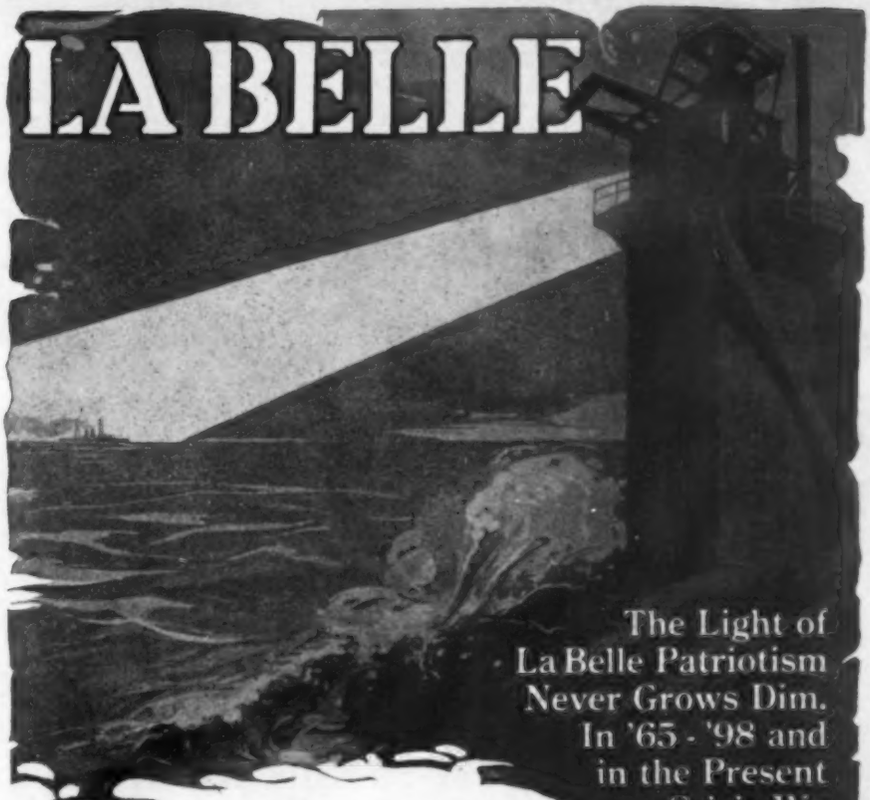
THE AMERICAN TUBE & STAMPING COMPANY

HOT AND COLD ROLLED
STRIP STEEL

WORKS AND MAIN OFFICE: BRIDGEPORT, CONN.

NEW YORK OFFICE 120 BROADWAY.
WORCESTER, MASS., PARK BUILDING.

LA BELLE



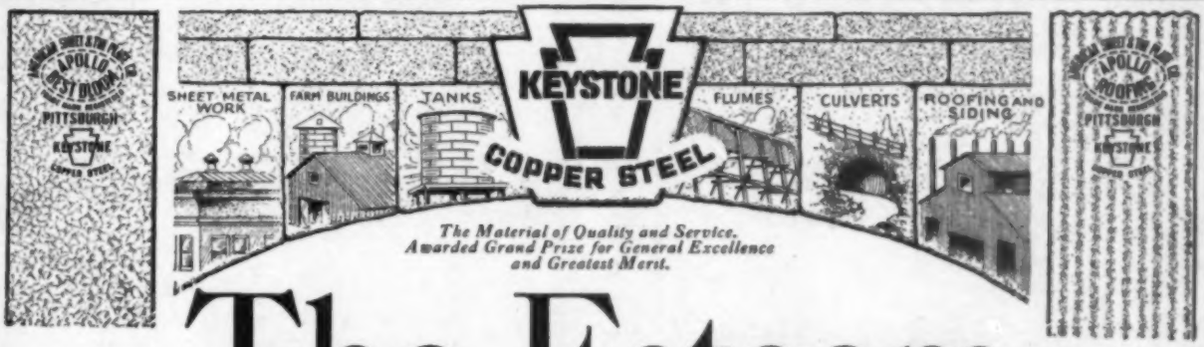
The Light of La Belle Patriotism Never Grows Dim. In '65 - '98 and in the Present Crisis We answered The Call.

La Belle Iron Works

"From Mine to Market"

General Offices at Steubenville, Ohio

Works: Steubenville, O., and Wheeling, W. Va.



The Material of Quality and Service.
Awarded Grand Prize for General Excellence and Greatest Merit.

The Esteem

in which *Keystone Copper Steel* Sheet and Tin Mill Products are held is born of a certain and intimate knowledge of their superiority in actual service—an estimation which is highest among those who have used *Keystone* longest.

American Sheet and Tin Plate Company

General Offices: Frick Building, Pittsburgh, Pa.

DISTRICT SALES OFFICES:

Chicago Cincinnati Denver Detroit New Orleans New York Philadelphia Pittsburgh St. Louis

Export Representatives: United States Steel Products Company, New York City

Pacific Coast Representatives: United States Steel Products Company, San Francisco, Los Angeles, Portland, Seattle

TRUMBULL

Open Hearth
Ingots, Blooms,
Billets, Slabs,
Sheet Bars

Blue Annealed
Steel Sheets

Black and Galvanized Sheet Steel

Galvanized and
Painted Formed
Products

Coke Tin Plate

Hot and Cold
Rolled Strip Steel

THE
TRUMBULL STEEL COMPANY
General Office:
Warren - - Ohio

Fine Finished Steel
High Carbon and Low Carbon
Sheets, Strips, Bars, Rods, Wires
Steel Tubing, Forged Rings
Forging Billets, Electric Iron

CARRIED IN STOCK

Edgar T. Ward's Sons Co.
BOSTON NEW YORK NEWARK
CHICAGO PHILADELPHIA

TIN PLATE

If our capacity were as small as the capacities of many other plants, we would not be able to equal our present immense output of high grade tin plate.
If our capacity were as large as the capacities of some other plants, we would not be able to give every order the personal attention that it now receives.
We figure that our mill is *"the happy medium"*. While it has a large output, it is not so large but that our Superintendent and Heads of Departments can keep constantly in touch with every process through which every order passes.

CARNAHAN TIN PLATE & SHEET CO.
Main Office and Plant
CANTON, O.
Eastern Office
537 The Bourse, Philadelphia, Pa.

WEIRTON STEEL CO.
Formerly the Phillips Sheet & Tin Plate Co.
General Office, WEIRTON, W. VA.

Hot and Cold Rolled Strip Steel

District Offices:
50 Church St., New York—2032 Dime Bank Bldg., Detroit, Mich.—La Salle Steel Co., 2305-25 South Halstead St., Chicago, Ill.
E. R. Hensel Steel & Copper Co., St. Louis, Mo.—Balfour, Guthrie & Co., Seattle and Tacoma, Wash.,
San Francisco, Cal., Portland, Ore. and Vancouver, B. C.

Russell, Burdsall & Ward Bolt & Nut Co.
PORT CHESTER, NEW YORK
ESTABLISHED 1845

Makers of The Celebrated EMPIRE BOLTS and NUTS

Western Office: Continental & Commercial Bank Building, Chicago, Ill.
Branch Works: Rock Falls, Ill.

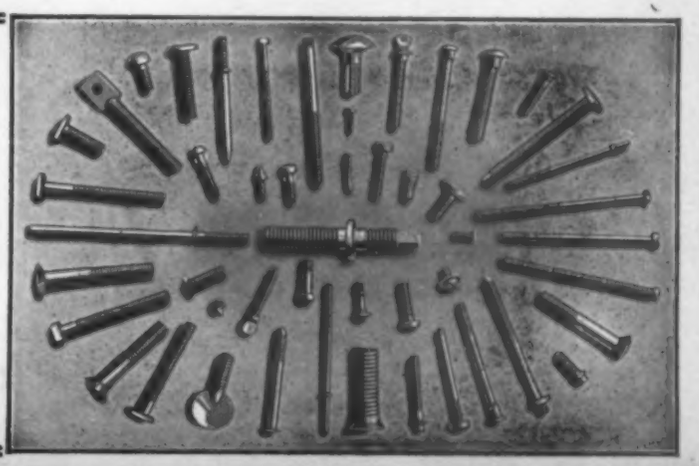
Screws—Rivets—Studs

Sink Bolts, Closet Screws, Complete Line of Machine Screws Boxed for the Hardware Trade. Threaded Wires.

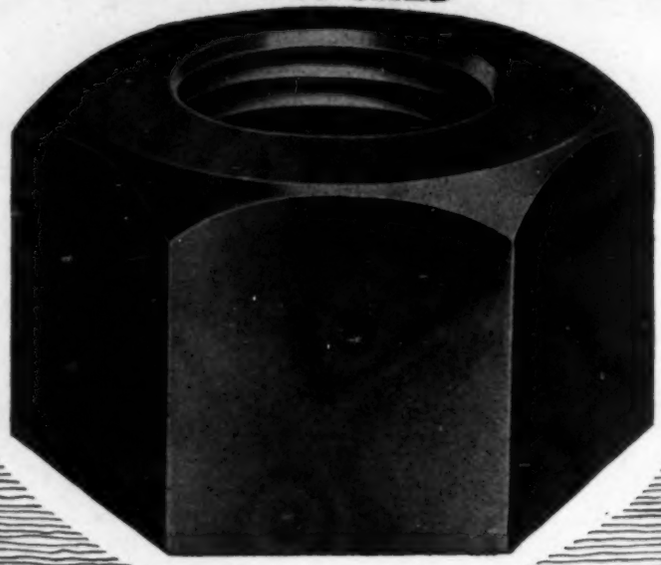
Each article illustrated was made for discriminating customers who demand something better than the usual kind. Our process enables us to make many articles that are now made on screw machines. We make them **just as good, much quicker and MUCH cheaper**

Estimates gladly furnished *State quantity and submit samples*
Catalog mailed upon request

The Progressive Mfg. Co.
Screw and Rivet Specialists TORRINGTON, CONN.



MILTON
LARGE COLD PUNCHED NUTS



Sizes, 2¼" to 8" diameter bolt.

Clean, sharp, accurate, full strength threads.

Cold-punched from finest material obtainable—excellent finish.

Let us know your requirements.

The Milton Mfg. Co.
MILTON, PA.

WASHERS
Wrought and Steel Plate

The Highest Grade, of All Descriptions.

Standard sizes shipped promptly. *Special* sizes on short notice. Also

Annealed Rivet Burrs
Felloe Plates, Etc.

Let us know your requirements. We guarantee Quality and Service.

Wrought Washer Mfg. Co.
MILWAUKEE, WIS.

Machine, Carriage, Track and Bridge Bolts.

BOLTS

Pole Line Material and Wagon Irons, Picks, Mattocks, Grub Hoes, Crow Bars, Wedges, etc.

OLIVER IRON & STEEL CO.
ESTABLISHED 1863
PITTSBURGH, PA.

American Steel Co.

Manufacturers

TIN PLATE
WIRE NAILS

Prompt Shipments

Write for Catalogue

American Steel Co.

Park Building, Pittsburgh, Pa.

FUEL OIL
Our unprecedented
QUICK SERVICE
even in war times makes
WARRENOIL
truly the dependable fuel
Three great factors are back of "Warrenoil" dependability. They are unlimited supply, privately owned tank cars, and proximity to your plant. A rush shipment of "Warrenoil" is not contingent upon shortage of supply, traffic congestion or car shortage. And as to the quality of "Warrenoil"—we will match it with any other fuel oil on the market. Write for quotations.
WARREN OIL COMPANY OF PENNSYLVANIA
Pittsburgh Office, 414 Empire Bldg. WARREN, PA. Buffalo Office, 77 Main St.

FUEL OIL

Requires less storage space for an equal number of heat units.

Does away with ash handling.

Requires no stoking gang.

Reduces the wear on grates and linings.

Raises steam quickly.

No fuel loss from banking fires.

Some users:

Carnegie Steel Company
American Bridge Company
Jones & Laughlin Steel Company
Pittsburgh Steel Company
Mesta Machine Co.
Follansbee Brothers Company
American Rolling Mill Co.
Pittsburgh Spring & Steel Co.
Pressed Steel Car Company

CLARENDON REFINING CO. **Oliver Bldg. Pittsburgh, Pa.**

Refineries, Clarendon, Pa.

J. H. Hillman & Sons Company

OLIVER BUILDING PITTSBURGH, PA.

Low Phosphorus Connellsville BLAST FURNACE COKE

FOR

Bessemer & Low Phosphorus Iron

Shipments 3,000,000 Tons Annually

Prompt Shipment **Any Railroad Delivery**

FUEL OIL

OKLA. S & Z PENNA.

Manufacturers Marketers

Our Own Tank Line at Your Service!

Gasoline, Naphtha, Kerosene, Mineral Seal, Lubricants & Wax

Works at: Kane & Eldred Pennsylvania

SLOAN AND ZOOK

Offices: Bradford Pennsylvania.

The Holbeck Pulverized Coal System

is delivering

One Million Pounds of Pulverized Coal Per Hour

to

Over 1200 Furnaces

Including Annealing, Bushelling, Continuous Billet, Bloom Heating, Converters, Drop Forge, Galvanizing Pots, Ingot, Puddling, Plate Heating, Reverberatory, Sheet and Pair, Spring Furnaces and Tin Pots.

Our Engineers will be glad to figure on your Requirements.

Write for Catalog and List of Plants

THE BONNOT CO. **Canton, Ohio**

FUEL OIL

PROMPT SHIPMENT

TANK CAR LOTS

F. O. B. Toledo, Ohio

The
Paragon Refining Co.
TOLEDO, OHIO

FUEL ECONOMY

MEANS

SMITH GAS PRODUCERS

Furnace Economy is obtained by
COLD CLEAN GAS.

Increased Production at Lower Costs.

Our Engineer and our experience at your service.

Write Now

The Smith Gas Engineering Co.
DAYTON, U. S. A.

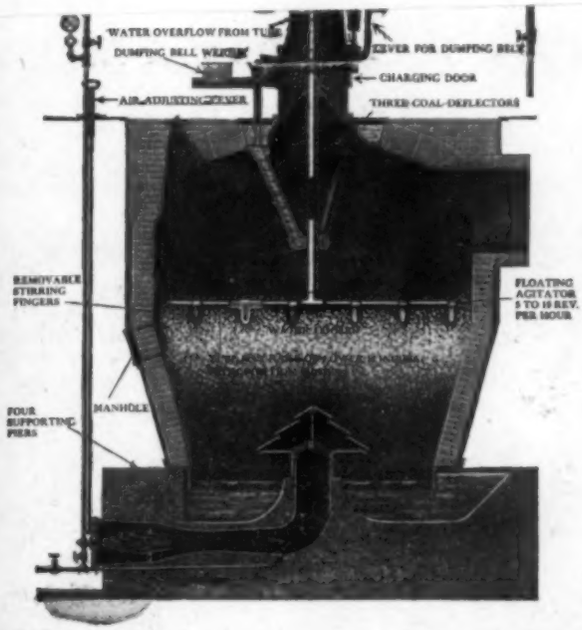
Sales Canadian Agents, The Canadian Allis-Chalmers, Ltd.

Chapman Floating Agitator

WEIGHTS FOR REGULATING DEPTH OF AGITATOR IN THE SURFACE OF THE FIRE BED
WATER INLET
HOSE
ECCENTRIC ROD
REVOLVING LUG ON WORM WHEEL IN SLIDING CONTACT WITH SCREW, CAUSES AGITATOR TO RISE OR FALL ACCORDING TO HEIGHT OF FIRE BED
1 H. P. MOTOR
WORM GEAR RUNS IN OIL
CHARGING DOOR LEVER

For any type of Stationary Gas Producer

A mechanical device which saves fuel and labor, and materially increases producer capacity.



Built with or without Automatic Feed

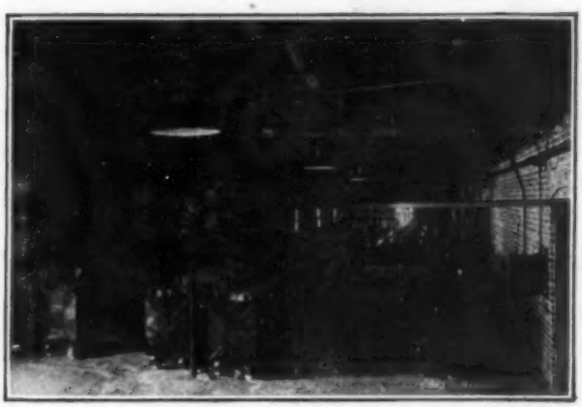
Wonderful results are being obtained with these Machines in the Steel Industry.

Write us for complete information and descriptive bulletin

Chapman Engineering Company

MT. VERNON, OHIO

11 Broadway, New York **1323 Oliver Bldg., Pittsburg**



One dollar or three!

which would you prefer to pay for your oxygen?

There is 66% profit for you if you produce your own Oxygen by the use of Levin Cells.

This process will enable you to produce oxygen at ⅓ the cost of buying Oxygen in cylinders.

Bettendorf Oxygen Hydrogen Co., Bettendorf, Iowa Operate 200 Levin Cells.

Levin Cells

Each Levin Cell is a welded unit weighing only 185 lbs. and can be installed in number sufficient to produce the required amount of gas. Their installation and operation are simple and inexpensive.

Mechanical, electrical and chemical weaknesses of old-time generators have been entirely overcome in this perfected apparatus.

Write for detailed information.

Electrolytic Oxy-Hydrogen Laboratories, Inc.

I. H. Levin, Technical Director

Laboratories and Works: Dayton, Ohio

Electrolabs

General Offices: 15 William Street New York

THE PITTSBURGH ELECTRIC FURNACE

THE MOST RAPID, POWERFUL AND EFFICIENT STEEL-MAKING FURNACE ON THE MARKET.

These Furnaces effect large economies over other steel making methods in steel foundries.

PITTSBURGH FURNACE COMPANY

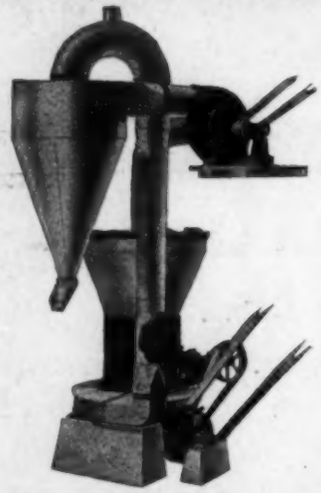
PITTSBURGH FURNACE COMPANY

707 Union Bank Building
PITTSBURGH, PA.
Phone Court 4112

215 Sycamore St.
MILWAUKEE, WIS.
Phone Grand 123

The use of **Pulverized Coal** in **Open Hearth Furnaces** was not a success until the **RAYMOND SYSTEM** was used for grinding the coal.

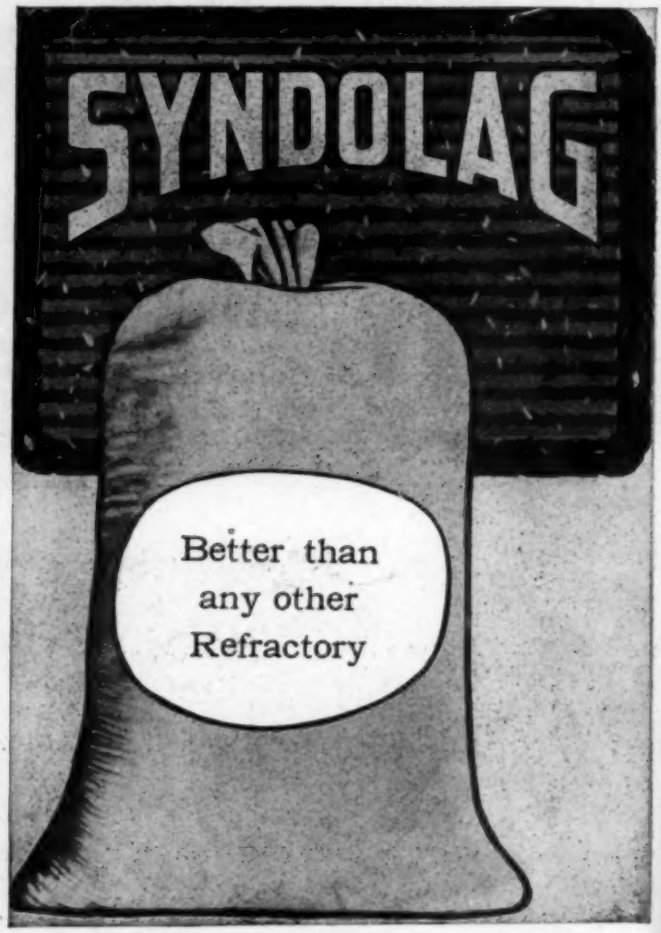
With the Raymond System of Pulverizing and Air-Separation instead of screen separation you get any fineness of coal desired and the resultant product is so uniform that it burns immediately when introduced into the furnace.



It is for this reason that the Raymond System has played such an important part in the development of Pulverized Coal as a Metallurgical Fuel.

A full description of this System will be mailed you upon request.

Raymond Bros. Impact Pulverizer Co.
1313 North Branch St. Chicago, Ill.
WESTERN REPRESENTATIVE:
The Dry Milling Engineering Company,
213 Boston Building, Denver.



Utilize every ounce of coal

Fire your furnaces with Pulverized Coal

Ideal starting conditions, Complete combustion, Absolute fuel control, Increased furnace capacity, Unaffected by weather conditions, Always ready for service. Ask for Catalogue No. 71 describing Pulverized Coal Equipment.

Fuller-Lehigh Company

Main Office and Works: Fullerton, Pa.

BRANCH OFFICES:
New York, N. Y., 50 Church St. Chicago, Ill., McCormick Bldg.

"They Last Longer"

150,000 Daily

A Good High Grade Missouri Fire Brick

—made from a high grade Missouri flint fire clay that contains enough plastic clay in its natural formation to make the bond. Unusual? Yes, but the

A. P. GREEN FIRE BRICK COMPANY'S "CROWN"

is an unusually *good* Fire Brick. "Crowns" are used extensively in our so-called territory—and way out and far beyond our territory. Past performance has proven the merits of this brick. It's "at home" anyplace. "Crowns" are made by the soft mud, stiff mud or dry press process, with a coarse or fine texture and burned light, medium or hard according to the service they will get. They are made to meet each individual requirement. "Crowns" are designed for the highest working temperatures encountered in standard furnace practice—with a good factor of safety in reserve.

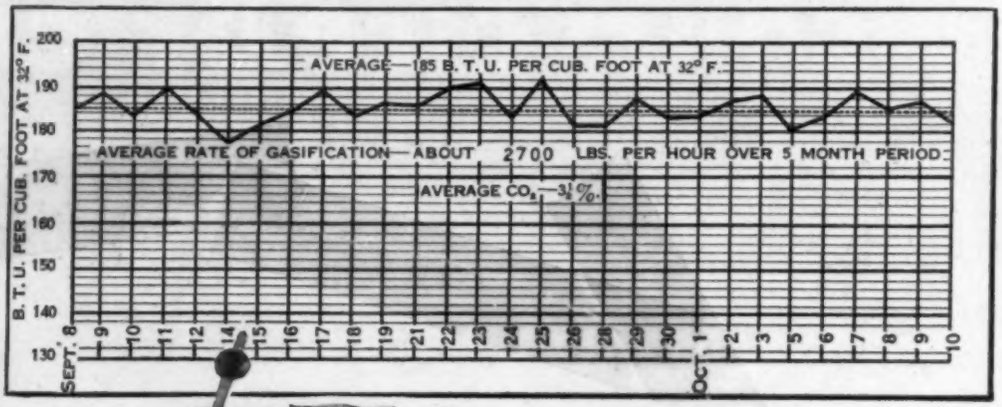
Just a simple request by mail or wire will start a sample "Crown" to you. 'Twould be well to mention the work you want it to do, so we will know which particular "Crown" to send. Just remember, our large production makes prompt delivery a reality—and we have two other high grade fire brick, "Standard" and "Empire".

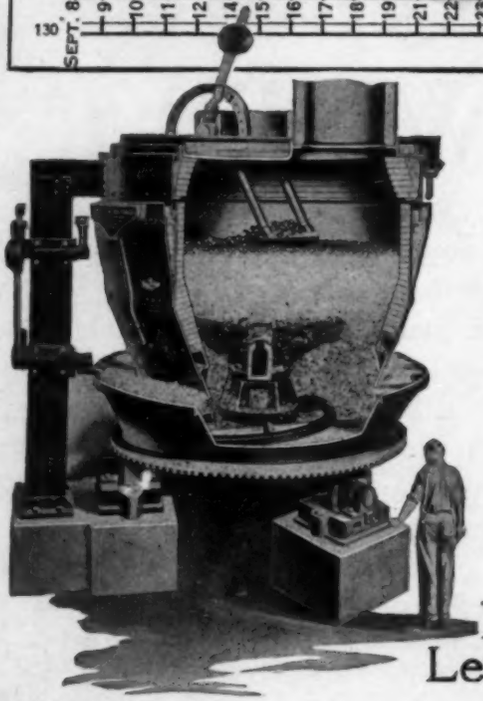
A. P. GREEN FIRE BRICK CO.
MEXICO :: :: :: MISSOURI

MORGAN
OF WORCESTER
PRODUCER GAS MACHINE

M C Co

Eight-hour Continuous Gas Samples from records of work's chemist at one of the well known Steel Plants in the U.S.A.


B. T. U. PER CUB. FOOT AT 32° F.
200
190
180
170
160
150
140
130
AVERAGE 185 B. T. U. PER CUB. FOOT AT 32° F.
AVERAGE RATE OF GASIFICATION ABOUT 2700 LBS. PER HOUR OVER 5 MONTH PERIOD
AVERAGE CO_2 — 3¼%
SEPT. 8 9 10 11 12 14 15 16 17 18 19 21 22 23 24 25 26 28 29 30 OCT. 1 2 3 5 6 7 8 9 10



MORGAN PRODUCER GAS MACHINES maintain the quality of gas continuously at a high value . . . the operation is not dependent upon the human element .

Continuous Mechanical Feeding, Levelling and Ash Discharge

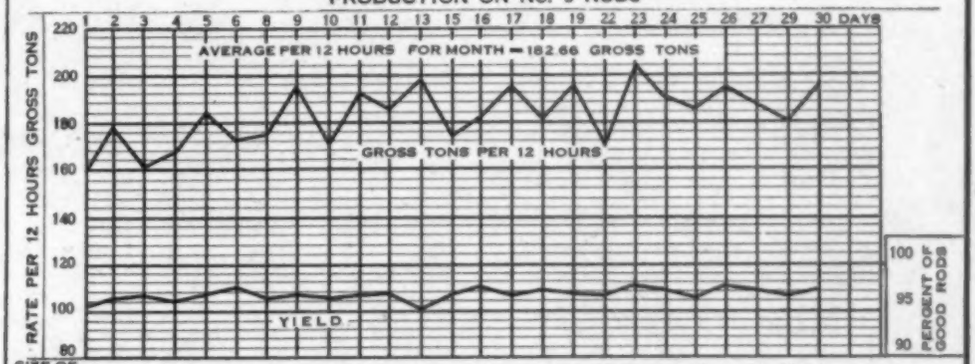
MORGAN CONSTRUCTION CO.
WORCESTER, MASS., U.S.A.

MORGAN
OF WORCESTER
CONTINUOUS DOUBLE STRAND
ROD MILLS

M C Co

MONTHLY RECORD — **APRIL 1918**

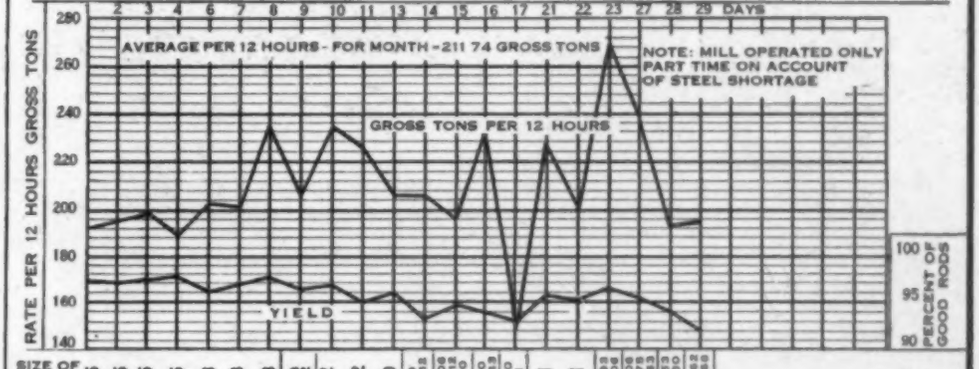
PRODUCTION ON No. 5 RODS


AVERAGE PER 12 HOURS FOR MONTH = 182.66 GROSS TONS
GROSS TONS PER 12 HOURS
YIELD
RATE PER 12 HOURS GROSS TONS
PERCENT OF GOOD RODS

SIZE OF ROD	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
HOURS	24	24	24	24	24	10	24	24	24	24	24	24	6	24	24	24	24	24	24	24	24	24	24	24	24	10	24	24	554
GROSS TONS	325.87	354.45	327.65	334.81	369.62	144.63	349.98	389.27	341.95	383.02	372.29	99.11	346.41	360.70	385.70	363.37	391.05	337.48	407.12	379.44	374.08	387.47	156.24	361.59	390.17	46.17 SINGLE TURNS	TOTAL GROSS TONS 8433.47		

MONTHLY RECORD — **MAY 1918**

PRODUCTION ON MISCELLANEOUS ROD SIZES


AVERAGE PER 12 HOURS - FOR MONTH - 211 74 GROSS TONS
NOTE: MILL OPERATED ONLY PART TIME ON ACCOUNT OF STEEL SHORTAGE
GROSS TONS PER 12 HOURS
YIELD
RATE PER 12 HOURS GROSS TONS
PERCENT OF GOOD RODS

SIZE OF ROD	5	5	5	5	3	3	3	3	2	2	0	.0 .318	.308 .318 00	.00 .348	00 1	1	1	.388 .406	.376 .383	.363 .430	.462 .468								
HOURS	24	24	24	10	24	24	24	24	24	7	24	24	24	24	12	24	94	24	24	12	12	424							
GROSS TONS	384.81	388.38	391.05	155.35	407.12	406.22	466.93	409.80	466.05	133.03	410.68	411.58	392.83	462.48	150.88	454.43	159.81	538.36	474.08	193.74	195.53	35.20 SINGLE TURNS	TOTAL GROSS TONS 7453.14						

MORGAN CONSTRUCTION CO.
WORCESTER, MASS., U. S. A.

Westinghouse

Adaptability

The work done in the steel mills during the war, has been of a more or less special nature, for special purposes—in many instances necessitating radical changes in mill schedules and methods of operation.

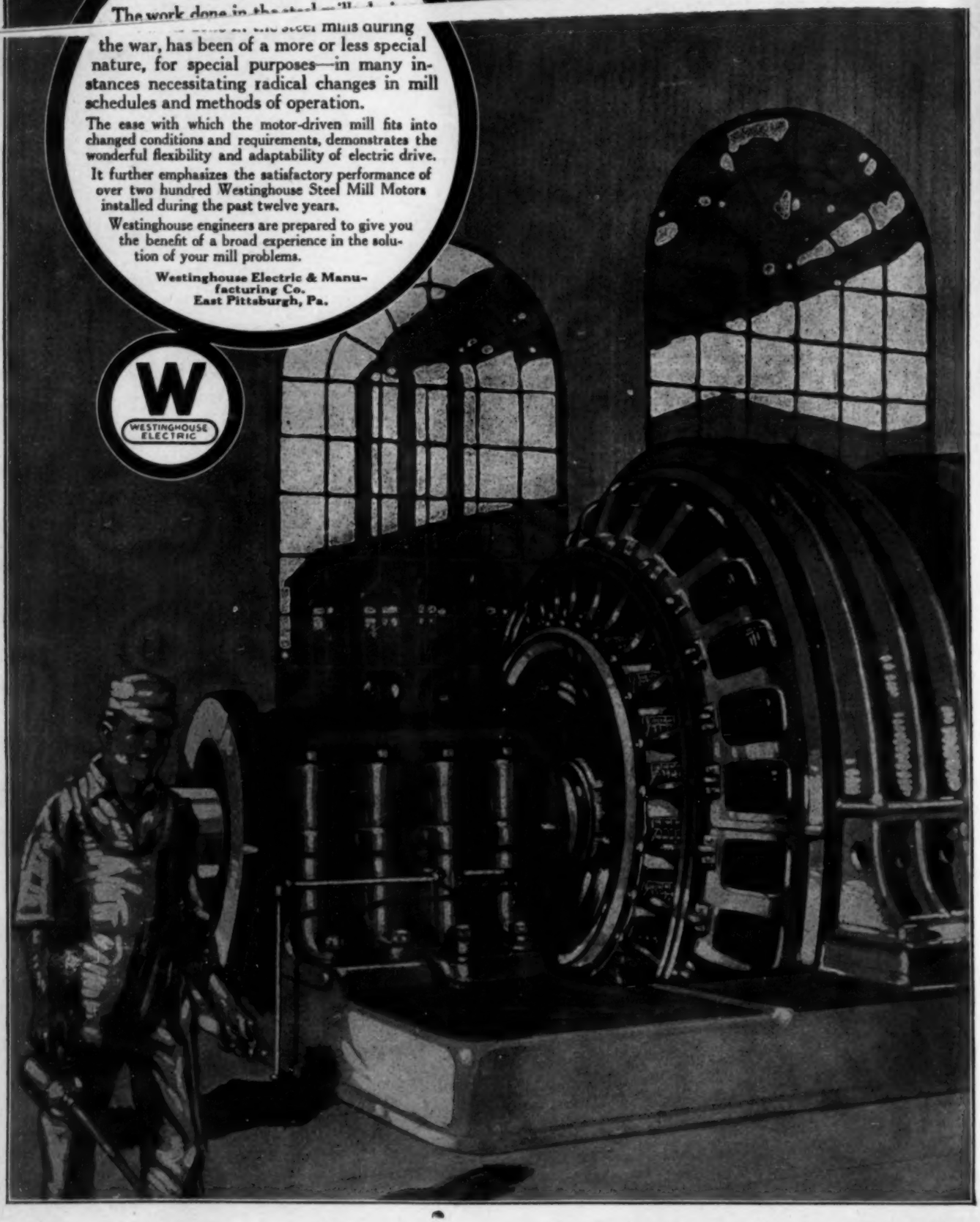
The ease with which the motor-driven mill fits into changed conditions and requirements, demonstrates the wonderful flexibility and adaptability of electric drive.

It further emphasizes the satisfactory performance of over two hundred Westinghouse Steel Mill Motors installed during the past twelve years.

Westinghouse engineers are prepared to give you the benefit of a broad experience in the solution of your mill problems.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.

W
WESTINGHOUSE ELECTRIC



BERGER MANUFACTURING COMPANY, CANTON, OHIO

Over 130,000 Sq. Ft. of Kreolite Wood Block Floors

—laid for Berger Manufacturing Company in five years

Wood is the most perfect flooring material for almost every factory use. Its firm, fine texture meets the requirements of both light and heavy factory wear.

Kreolite Blocks furnish a system of factory flooring so enduring that it actually "outlasts the factory."

They are laid in the floor with the grain running perpendicular to its surface. The wear comes on the end of the grain.

There is a smoothness, resiliency, quietness, warmth and comfort underfoot, to be had only with Kreolite Wood Block Floors, which no other material can imitate.

Our floors are giving satisfaction in both old and new plants. **We make special resurfacing blocks for old concrete or mastic floors.**

* * * *

The Berger Manufacturing Company, of Canton, Ohio, is a typical example of continued appreciation of Kreolite Wood Block Floors.

For five consecutive years they have been using Kreolite Wood Block Floors and are continually adding more.

In June, 1915, they installed 20,700 square feet of Kreolite Block Flooring. On December 4th, the same year, 7,929 square feet more were placed in another portion of the factory. In 1916, another 31,500 square feet were laid. In 1917 they added 65,637 feet more and in 1918, 6,300 feet more.

This company is using our floors on their loading platforms, shipping and stockrooms, in front of their acid tanks and in parts of their annealing rooms. Their trucking is necessarily heavy and has had a harmful effect on other flooring materials but Kreolite Blocks have stood the test of time, temperature and heavy wear and tear.

Kreolite Wood Block Floors are particularly well adapted for use in Machine Shops, Foundries, Warehouses, Loading Platforms, Areaways, Round-houses, Paper Mills, Tanneries, Stables and Garages.

Our Technical Engineers will make a thorough study of your floor problems without obligation to you.

Let us send you our book about Kreolite Factory Floors. This book contains much valuable information of interest to industrial executives, engineers, architects and contractors. Sent immediately upon request.

THE JENNISON-WRIGHT COMPANY

2485 BROADWAY **TOLEDO, OHIO**

BRANCHES: New York, Chicago, Philadelphia, St. Louis, Pittsburgh, Cleveland, Detroit, Toronto and other principal cities.

WAR PUMPS--IMMEDIATE DELIVERY

ALLIS-CHALMERS *TYPE "S"*

Centrifugal Pumps in Stock for Prompt Shipment

SIZES 2"-3"-4"-6"-8"-10"-12"-14"-16"-18"-20"

SHIPMENTS AS SHORT AS ONE WEEK.

WE ALSO HAVE MOTORS IN STOCK TO DRIVE THESE PUMPS

If you need Pumps for any service write or wire your requirements.

Our Centrifugal pump bulletin 1632 B I describing our standard pumps will be sent on request.

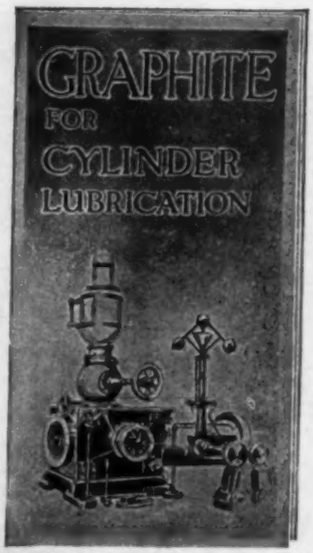
Allis-Chalmers Mfg. Co. = = Milwaukee, Wis.

BETTER Cylinder Lubrication at Half the Cost

Dixon's Flake Graphite is the ideal lubricant for cylinders. It reduces friction in cylinders and valves, lengthens the life of packing, prevents scoring of valves, eliminates oil from the exhaust, and saves fuel.

Many engineers have written us that they have cut the cost of lubricating cylinders in half by using Dixon's Flake Graphite.

Write for a copy of this Booklet and find out about the wonderful possibilites of Dixon's Flake Graphite for your plant. Ask for Booklet No. 64C.



Made in JERSEY CITY, N. J. by the

JOSEPH DIXON CRUCIBLE COMPANY

ESTABLISHED 1827

Heating Furnaces

Equipped with

Type H Stokers

The Standard Practice In Modern Mills

Get in Touch With Us

Combustion Engineering Corporation

11 Broadway, New York City

REPRESENTED BY

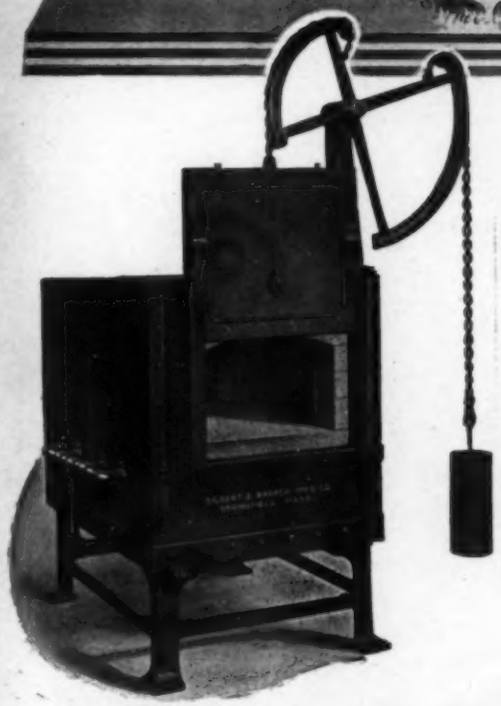
GEORGE J. HAGAN CO.

IN PITTSBURG, PA.

(401 People's Bank Bldg.)

Gilbert & Barker FURNACES

for Prompt Delivery



Behind the power and beauty of the pleasure car lies the indispensable work of the heat treating furnace

Power and ***beauty*** are not ***all*** there is to car construction. ***Power*** arouses the interest of your prospective buyer; ***beauty*** helps to put the sale across; but it requires besides these, ***car endurance*** to make a satisfied customer.

Heat-treat your car parts in a ***Gilbert & Barker Furnace*** and you will not only justify your car's claim for power and beauty, but you will also establish for it a reputation of strength and endurance.

Gilbert & Barker Furnaces are adapted to all classes of heat treating. Built in a hundred standard types.

Following is a partial list of installations: Willys-Overland; Chalmers, Maxwell Motors; Fiat; Pierce Arrow; Autocar Co.; Buick; Mercer; Locomobile; Ford; International Motors; Hendee Mfg. Co.; Knox Motors; Cadillac.

Ask for Catalog 22.

Gilbert & Barker Mfg. Company

22 Union Street
Springfield, Mass.

Chicago Representative:
Neidow & Payson, Madison Terminal Building, 9 South Clinton Street, Chicago, Ill.

Detroit Office:
Garfield Building, 870 Woodward Ave., Detroit, Mich.

Philadelphia Office:
703 Lincoln Building, Philadelphia, Pa.

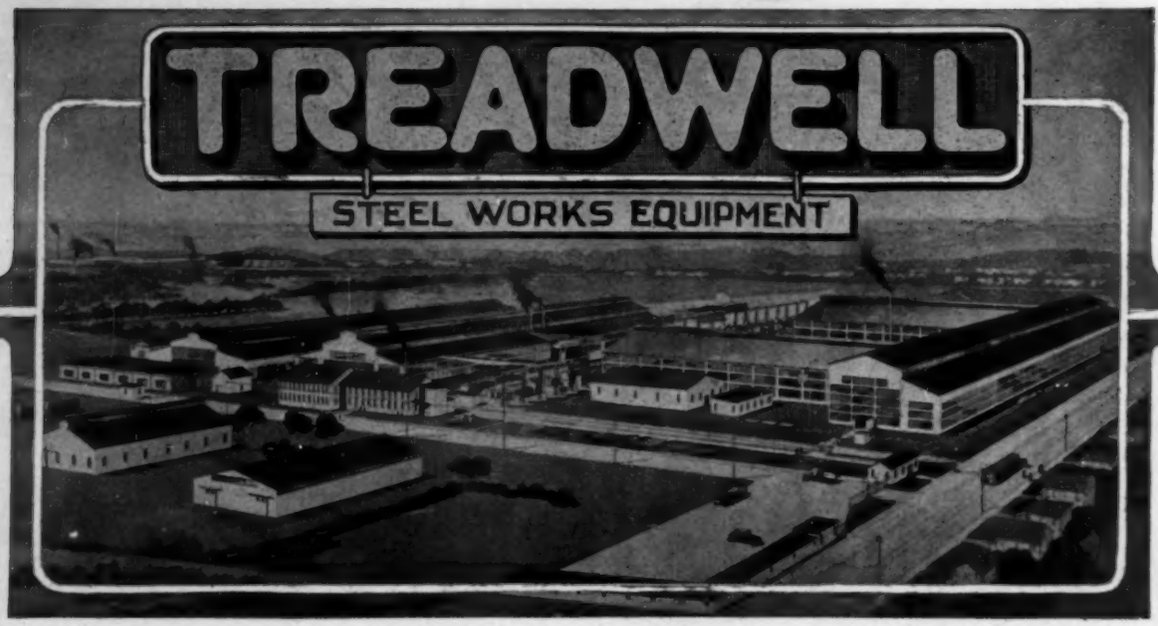
Pittsburgh Office:
Room 501, Manufacturers' Building, Pittsburgh, Pa.

New York Office:
Room 1107, 26 Broadway, New York City.

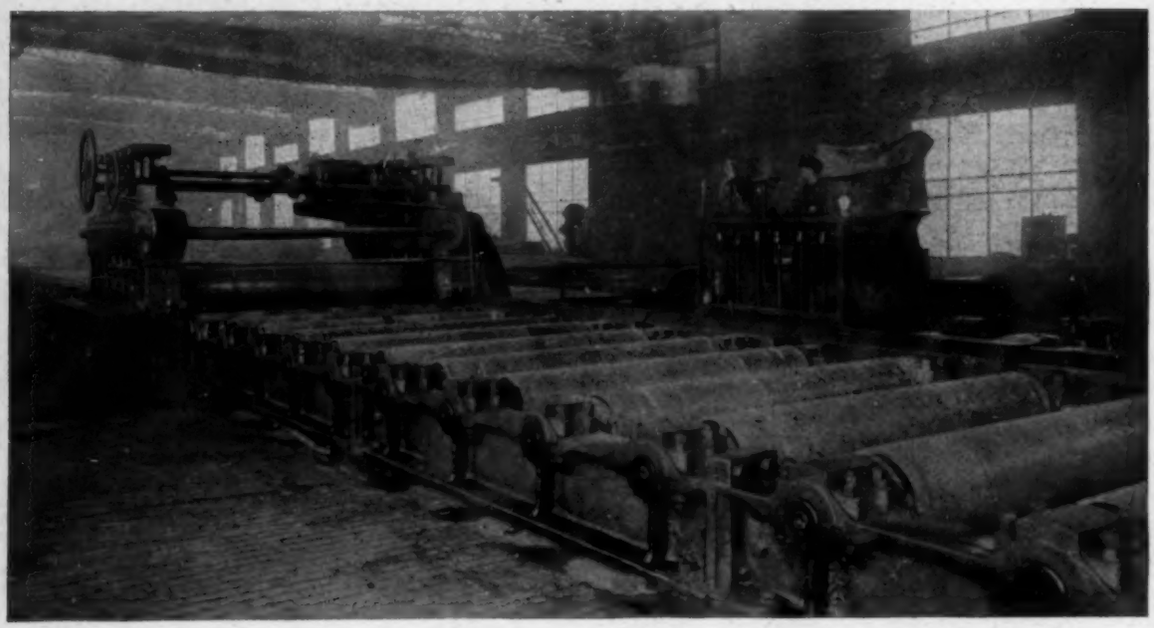
GILBERT & BARKER MFG. CO. G&B SPRINGFIELD MASS U.S.A. EST. 1865

TREADWELL

STEEL WORKS EQUIPMENT



Treadwell Means Service not only in the fulfillment of specifications, but also in the sense of assisting you to produce efficiently and economically.



36" x 110" Plate Mill Straightening Table

We are prepared to design and build all kinds of Rolling Mill and Steel Works Equipment.

We specialize on Mill Tables, Crop Conveyors, Shears, Ingot and Charging Box Cars.

TREADWELL ENGINEERING COMPANY
EASTON, PENNA.

LAKEWOOD 4½-TON
TROLLEY LOCOMOTIVE

LAKEWOOD No. 271
PLATFORM CAR

LAKEWOOD

INDUSTRIAL HAULAGE

Inter-Department Haulage

The cost of moving partly-finished products from one department to another is, sometimes, as great as the cost of transporting the finished article to the customer.

Reductions in Inter-Department Haulage cost—savings in man power—are possible if your Haulage System is well planned.

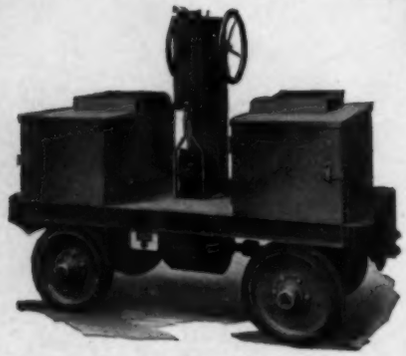
Lakewood Engineers are interested in reducing these costs. They have both "Flat" and "Flange Wheel" Systems to work with.

Delivery?—Yes!

LAKEWOOD No. 1161
CHARGING CAR

LAKEWOOD INDUSTRIAL HAULAGE

FLAT WHEEL FLANGE WHEEL



LAKEWOOD STORAGE BATTERY TRACTOR

LAKEWOOD STORAGE BATTERY PLATFORM TRUCK

LAKEWOOD

INDUSTRIAL HAULAGE

Help the Crane

Your crane has more work than it can do. Continual delays result.

Part of the crane's work can be done by a Lakewood Industrial Haulage System. Confine the work of your crane to lifting. Do the hauling by means of a Lakewood Haulage System.

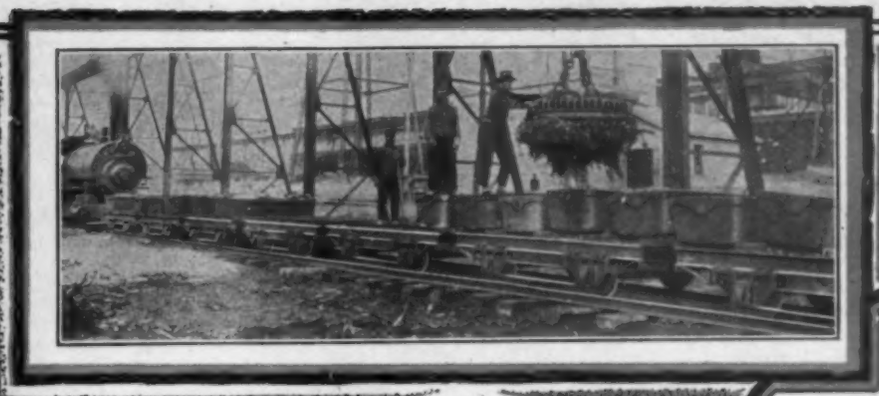
Possibilities such as this are considered by Lakewood Engineers when they are asked to assist in solving Haulage Problems.

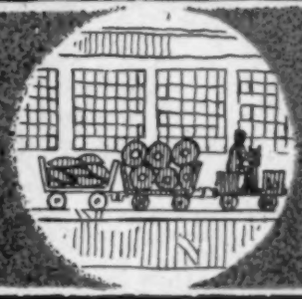
Deliveries?—Yes!

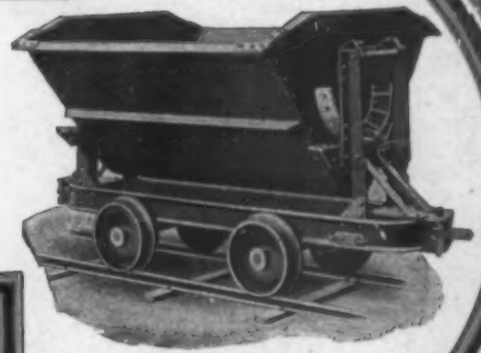
LAKEWOOD CASTOR TYPE TRAILER

LAKEWOOD INDU

FLAT WHEEL

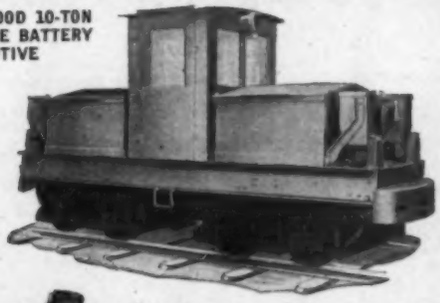






LAKEWOOD No. 241
V-DUMP CAR

LAKEWOOD 10-TON
STORAGE BATTERY
LOCOMOTIVE



LAKEWOOD No. 1697
CORE OVEN CAR

Link up with Lakewood

Lakewood Engineering Co., Cleveland

FACTORIES

LAKEWOOD GALION CHICAGO HEIGHTS WEST PARK MILWAUKEE ELYRIA

ALLIED ALLIED CONSTRUCTION MACHINERY CORPORATION ALLIED

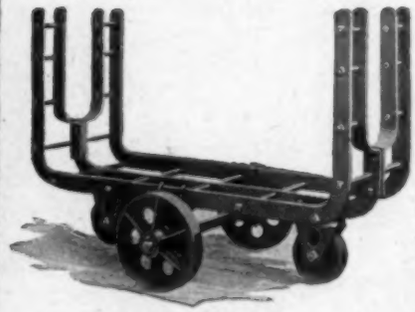
Export Department
120 Broadway New York, U.S.A.

STRIAL HAULAGE

FLANGE WHEEL

LAKEWOOD BALANCED TYPE TRUCK

LAKEWOOD No. 1714 BOX TRUCK



LAKEWOOD No. 1011 STEEL BUGGY

Link up with Lakewood

LAKEWOOD BUILT TO LAST

Lakewood Engineering Co., Cleveland

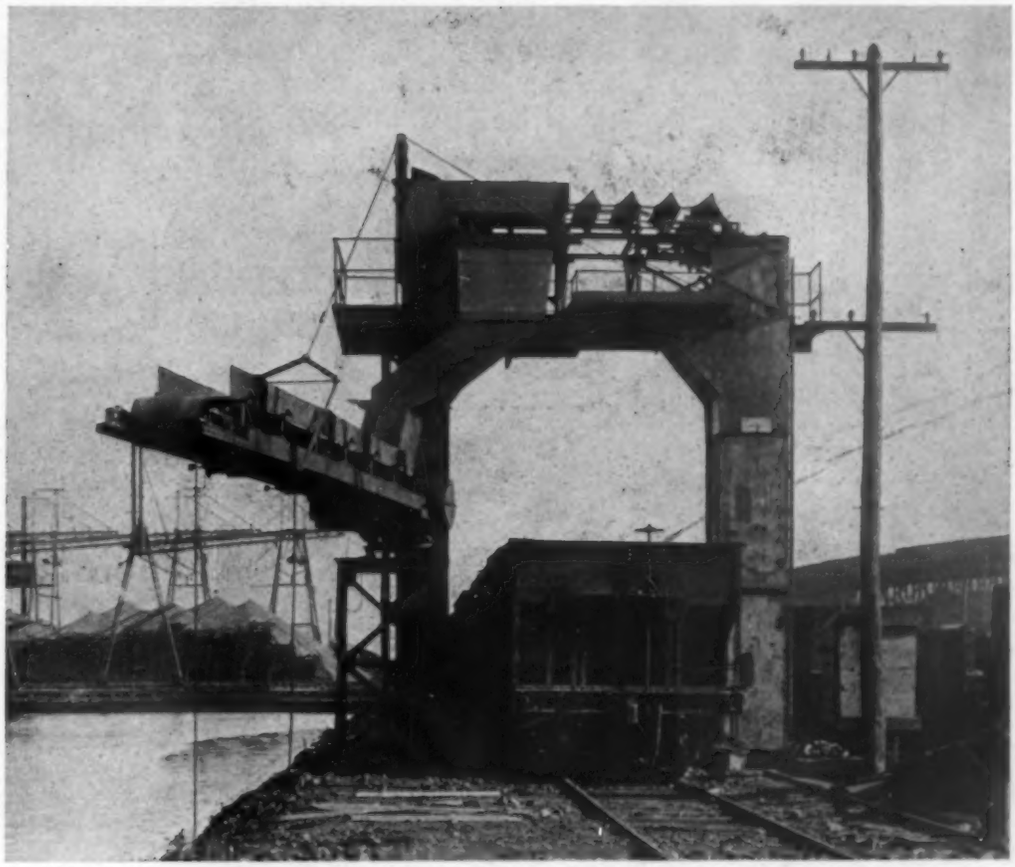
FACTORIES

LAKEWOOD GALION CHICAGO HEIGHTS WEST PARK MILWAUKEE ELYRIA

ALLIED Export Department ALLIED CONSTRUCTION MACHINERY CORPORATION 120 Broadway New York, U.S.A. ALLIED

LAKEWOOD INDUSTRIAL HAULAGE

FLAT WHEEL FLANGE WHEEL



Conveying Equipment For Transferring Coal From Cars to Boats

CONVEYING MACHINERY

particularly for those conditions which are unusual or exacting

THE C. O. BARTLETT & SNOW CO.

Main Office and Works: Cleveland, Ohio

MACKINTOSH HEMPHILL & CO

FORT PITT FOUNDRY

GENERAL OFFICES-1227 LIBERTY AVE
WORKS: 12TH & ETNA STS., PITTSBURGH, PA.

13-Foot, 6-Inch Helical Gear

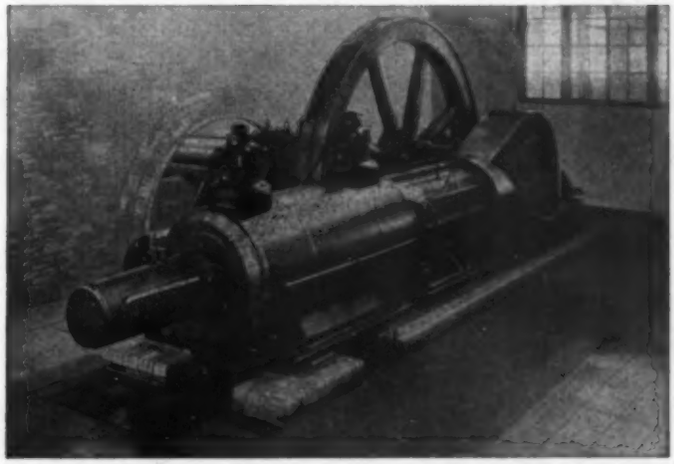
GEARS AND PINIONS

of Carbon or Alloy Steel

Scientifically Heat Treated to Withstand the Most Severe Service

A Trial Order Will Demonstrate the Longer Wearing Qualities of Our Gears and Pinions

MESTA
Una-Flow Steam Engines



The Ideal Engine for Rolling Mill Service.

Mesta Una-Flow Engines, using steam from modern waste heat boilers on open hearth furnaces and heating furnaces, provide the ideal means of driving Rolling Mills, with a low initial expense and no fuel cost.

The Mesta Machine Company is the sole licensee in the United States for building steam engines under the Stumpf Patents for driving metal rolling mills.

MESTA MACHINE COMPANY
PITTSBURGH - - - PA., U. S. A.

A. Garrison Foundry Co.

The Pittsburgh Foundry—Established 1803

Bingham Street **PITTSBURGH**

Rolling Mill Machinery

Presses Shears

One of our largest departments is devoted to Chilled Rolls. We make Chilled Rolls weighing 37½ lbs. for rolling gold and Chilled Rolls weighing 71,000 lbs. for rolling steel plate. The First Chilled Rolls made in America were made by us, and we have made a specialty of rolls and Rolling Mill Machinery ever since; for one customer in particular, of more than national prominence, we have made Chilled Rolls continuously since 1843.

O. H. STEEL
NICKEL STEEL
AND
ALLOY STEEL

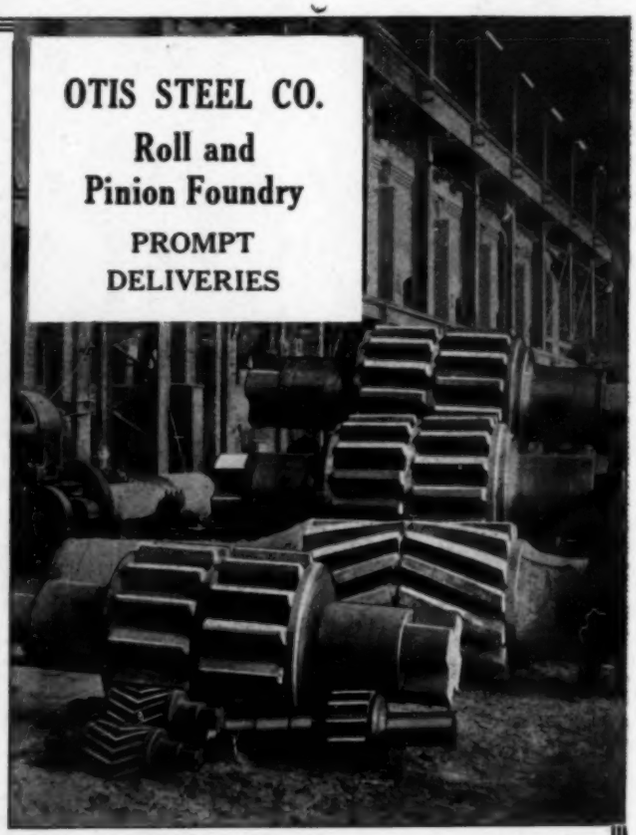
PINIONS

Cut or Cast Teeth

Otis Mill Pinions hold the World's Record for Service

We Solicit Your Orders for same quality.

OTIS STEEL CO.
Roll and Pinion Foundry
PROMPT DELIVERIES



THE OTIS STEEL CO., Cleveland, Ohio

Makers of Steel Castings from 1 lb. to 150,000 lbs. each. Rolled Steel Plates and Blue Annealed Sheets

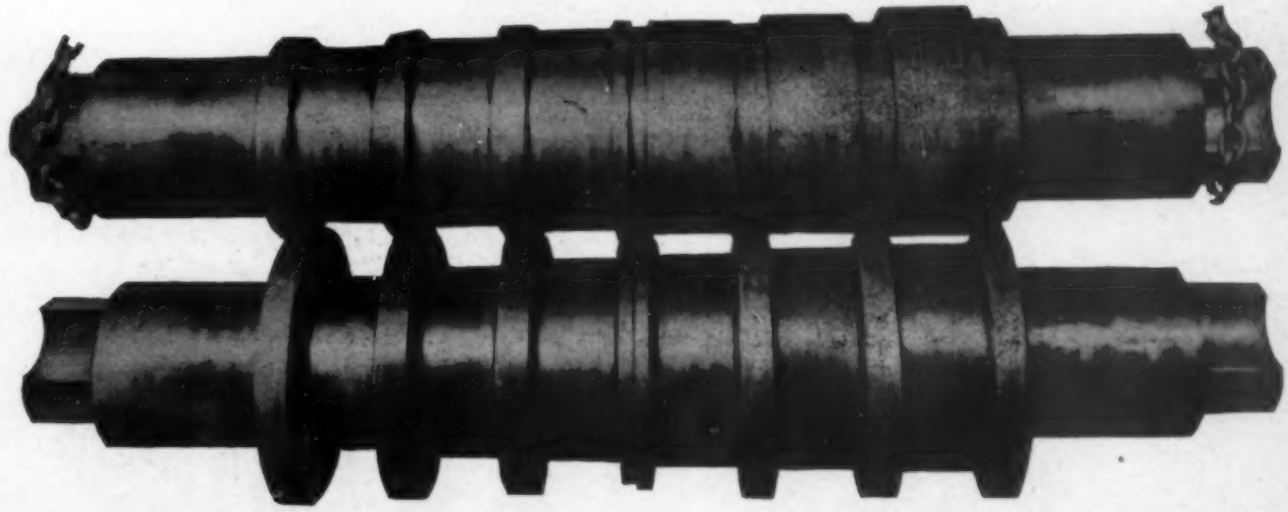
"WHEELING" QUALITY

STEEL ROLLS
SUPER-STEEL ROLLS

CHILLED ROLLS
SAND ROLLS

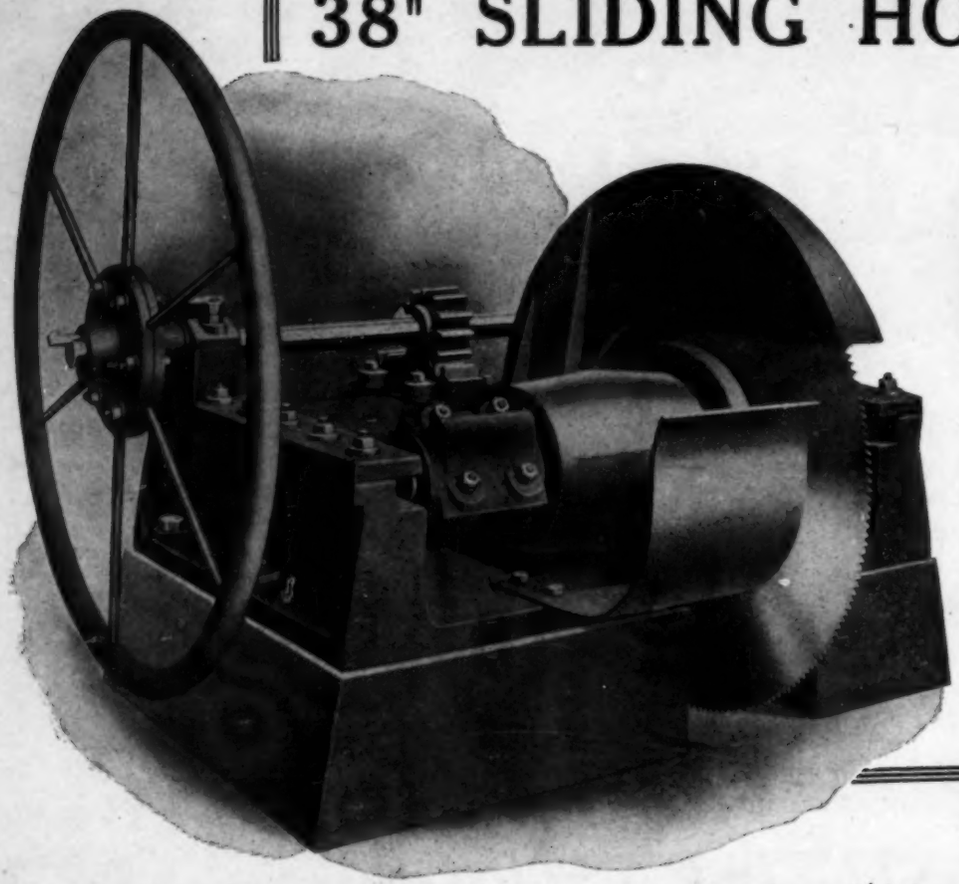
ROLLING MILL MACHINERY
SPECIAL MACHINERY
STEEL CASTINGS
IRON CASTINGS

WHEELING MOLD & FOUNDRY CO.
WHEELING, W. VA.



ASK US ABOUT THIS

38" SLIDING HOT SAW

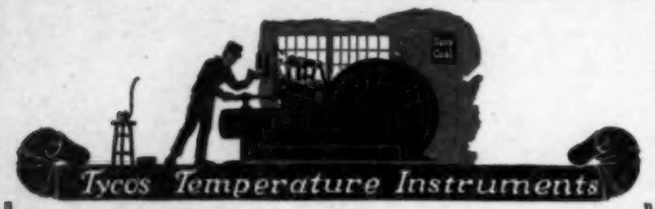


We are Specialists in the making of High Grade

ROLLS

The National Roll & Foundry Co.

AVONMORE
PENNSYLVANIA



Tycos Temperature Instruments

Mercurial, Recording and Index Thermometers for all industrial and laboratory applications.
Electric Contact Thermometers.
Temperature Pressure and Time Regulators.
Mercury Column Vacuum Pressure and U Gauges.
Base Metal, Rare Metal and Radiation Pyrometers.
Fery Radiation Pyrometers.
Hygrometers.
Hydrometers.
Mineral Oil Testing Instruments.

Aneroid Barometers.
Mercurial Barometers.
Recording Barometers.
Pocket Compasses.
Surveying Compasses.
Rain Gauges.
Anemometers.
Air Meters.
Thermographs.
Hand Levels.
Aviation Barometers.
Inclinometers.
Sphygmomanometers.
Fever Thermometers.
Urinary Glassware.
Thermometers of all kinds for home and general use.

242

Tycos the trade mark of an organization manufacturing indicating, recording and controlling Temperature Instruments of the *better* type, giving utmost satisfactory service; an organization that serves its trade sincerely in all dealings. The convincing proof of high quality of product is its growth.

Correspondence invited. We will do our best to give you the information desired, and not subject you to a long and mechanical series of follow-up letters.

Taylor Instrument Companies

Rochester, N. Y.

There's a Tycos and Taylor Thermometer for every purpose

Don't throw away that old sand, use it over and over again
by putting it through the

SIMPSON INTENSIVE FOUNDRY MIXER

A very small percentage of new sand will reclaim a very large percentage of old sand for you if you use this machine.

SAVE SAND! SAVE MONEY! SAVE LABOR!

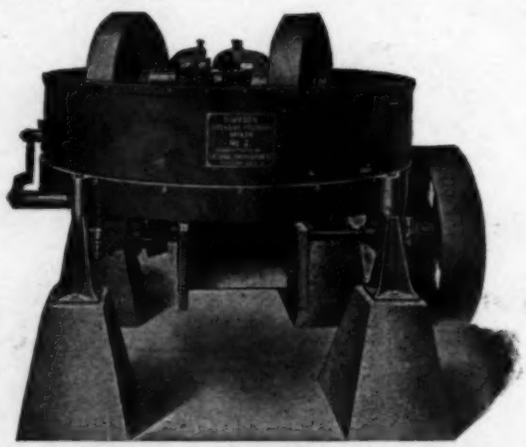
With this machine perfect core sand can be mixed in about two minutes with about 50% less compound than is required by other methods.

Facing sand of the utmost toughness and strength can be prepared in from three to four minutes.

When changing from one kind of sand to the other the machine can be thoroughly cleaned in a few minutes.

We are anxious to send you full particulars regarding this machine, and inform you of the surprising results that it is obtaining for its users.

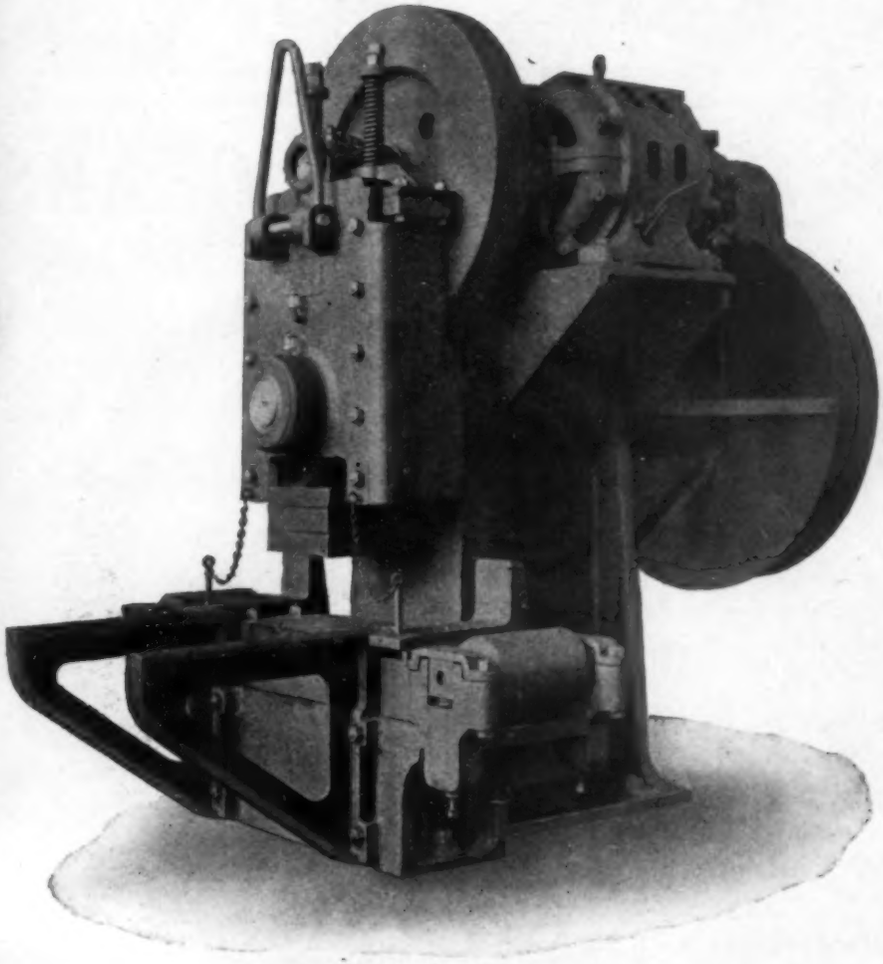
WRITE US AT ONCE.



NATIONAL ENGINEERING CO.
Machinery Hall Bldg., 549 W. Washington Blvd., CHICAGO, ILL.

"United" Straightening Presses

Designed for Rolling Mill Service—
which means **"Steady Diet"** at a full
rated capacity for a day, a month or a year.



No. 3 Rail Straightening Press

Semi-Portable Type

for straightening all sections of Tee and Girder Rails up to 150 pounds.

MADE IN TWO SIZES

Smaller press of same design for light section.

Horizontal Type

for straightening Rails, Beams or Round Sections.

Screw Adjustment for maximum or minimum gap, eliminating loose blocks.

MADE IN THREE SIZES

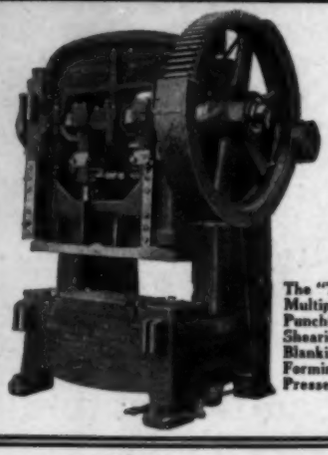
Bulletin R may contain some information you wish on straightening presses. Write for your copy.

UNITED ENGINEERING & FOUNDRY CO.

PITTSBURGH, PA., U. S. A.

Builders of Complete Machinery Equipment for Iron, Steel and Tube Works; Steel Castings; Machine Molded Gears; Forging Presses; Steel, Sand, Chilled and "Adamite" Rolls.

"Largest Roll Makers in the World, Makers of the Largest Rolls"



The "Toledo" Multiple Punching, Shearing, Blanking and Forming Presses.

THE "TOLEDO"

After-the-War Business Getters—
PRESSES that serve enduringly—
—that have almost unlimited capacity—
—that are unfailingly accurate—
—and whose economy is unquestioned both in upkeep and production.

The Toledo Machine & Tool Co., Toledo, Ohio

OVER-SEAS REPRESENTATIVE
ALMACO ALLIED MACHINERY COMPANY OF AMERICA ALMACO
130 BROADWAY, NEW YORK, U.S.A.
PARIS TURIN ZURICH BARCELONA

QUICK SERVICE

For Switch Yards and Steel Mills

No. 5625 STORAGE BATTERY LOCO-MOTIVE

Designed Especially for Moving Rolling Stock

Made in several sizes to suit requirements

If you own an *"Atlas" Storage Battery Locomotive* you don't have to wait until the railroad gets ready to do your switching. You can switch just *what* you wish, just *when* you wish. This will mean a great deal of time and convenience to you.

Any employe of ordinary intelligence can run this locomotive. All parts are easily accessible for oiling, adjustment and repair.

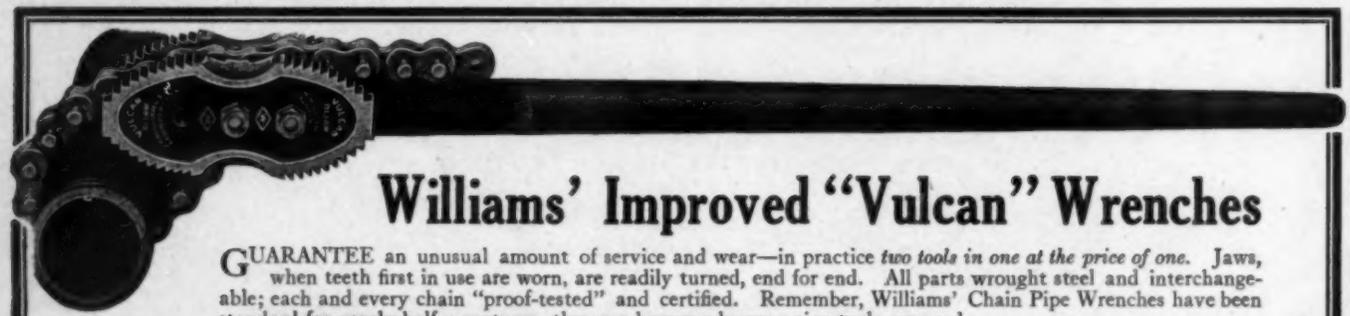
If you are interested in saving money, send for our catalog and read about our entire line of Storage Battery Locomotive Cranes and Cars.

The Atlas Car & Manufacturing Co.
1100 Ivanhoe Rd. Dept. E. Cleveland, Ohio

LARGE GEARS

CUT OR MACHINE MOLDED

TAYLOR-WILSON MFG. CO
ENGINEERS-FOUNDERS-MACHINISTS
MAIN OFFICE AND WORKS MIKEES ROCKS, PA.



Williams' Improved "Vulcan" Wrenches

GUARANTEE an unusual amount of service and wear—in practice *two tools in one at the price of one.* Jaws, when teeth first in use are worn, are readily turned, end for end. All parts wrought steel and interchangeable; each and every chain "proof-tested" and certified. Remember, Williams' Chain Pipe Wrenches have been standard for nearly half a century—they are known wherever pipe tools are used.

J. H. Williams & Co. *"The Drop-Forging People"*
58 So. Clinton St., CHICAGO, ILL. 58 Richards St., BROOKLYN, NEW YORK

"BLISS" No. 20 GANG
Four Operations at a Stroke

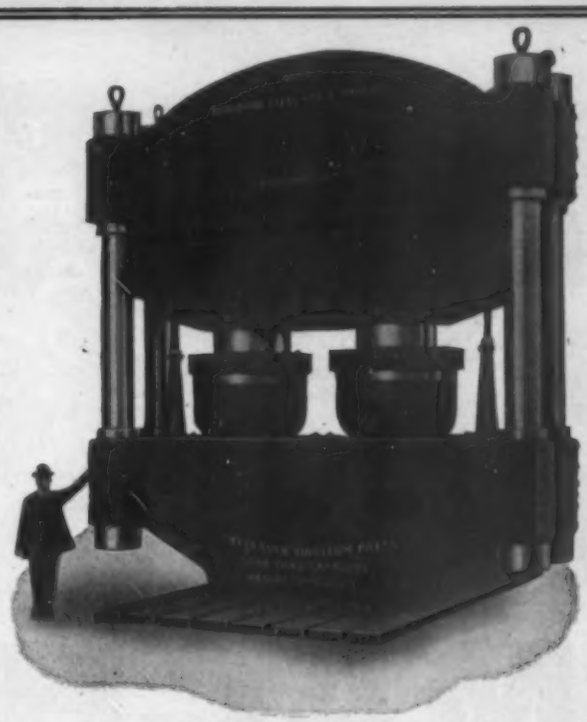
WORKING *for* PRODUCTION ?

Increased or more economical production for you may lie in one or more of the "Bliss" line of Presses.

Our work for sixty-one years has developed the greatest production capacity—and that necessarily means the ultimate reliability, convenience of operation and economy.

Our catalogue and any special information on request.

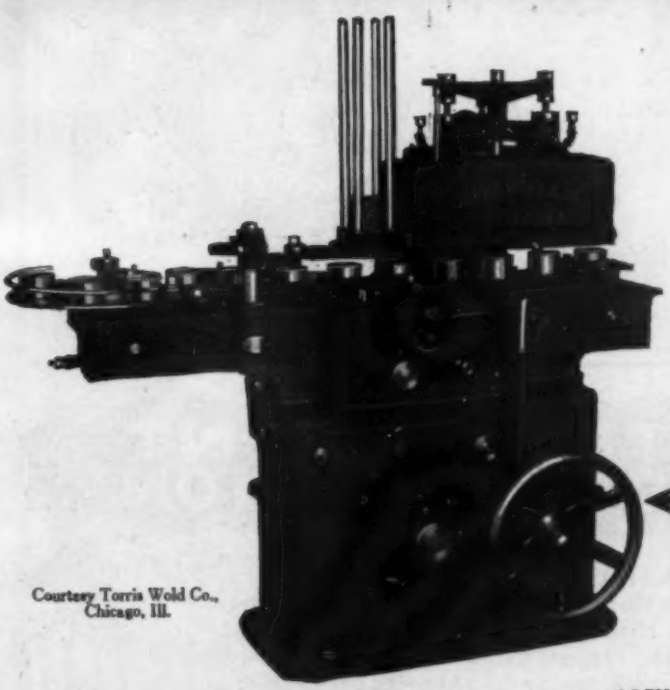
E. W. BLISS CO.
BROOKLYN, N. Y., U. S. A.
1857 1918
CHICAGO OFFICE People's Gas Bldg.
DETROIT OFFICE Dime Bank Bldg.
CLEVELAND OFFICE :: Union Bank Bldg.
LONDON, S. E., ENGLAND Pocock Street, Blackfriars Road
PARIS, FRANCE 100 Boulevard Victor-Hugo, St. Ouen



5000-Ton Hydraulic Press

Rolling Mill Machinery Hydraulic Presses and Accumulators
Blast Furnace and Steel Works Machinery
Acid Open Hearth Steel Forging Ingots Open Hearth Steel Castings
Cupola, Air Furnace and Charcoal Iron Castings
Rolls—Sand—Steel—Chilled Iron
Ingot Molds—Sand and Chill cast—Split and solid—All sizes and purposes
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

THE JOHNSON FRICTION CLUTCH



Courtesy Torris Wold Co., Chicago, Ill.

On the Cameron No. 153, Automatic Double Seamer with end feed, as manufactured by the Torris Wold Co., Chicago, Ill., a No. 5 JOHNSON SINGLE FRICTION CLUTCH is used.

Automatic work is the hardest task a clutch can be put to. Johnson Friction Clutches are giving entire satisfaction on the leading automatic machines.

There is a Johnson Clutch for your requirements.

Send for our White Catalog

Single Clutch with Pulley Mounted—Clutch Engaged.

AGENTS.

CANADA: Williams & Wilson, Ltd., 320 St. James St., Montreal; The Canadian Fairbanks-Morse Co., Ltd., Montreal and Branches. ENGLAND: The Efandem Co., 22 Newman St., Oxford St., London, W.1, Sole Agent for British Isles. AUSTRALIA: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth Street, Melbourne, Victoria. JAPAN: Andrews & George Co., 16 Takegawa-cho, Kiobashiku, Tokyo. SOUTH AFRICA: D. Drury & Co., Main St., Johannesburg. FRANCE: Anciens Etab Glaenzer & Perreaud, 18 Faubourg de Temple, Paris.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

THE
TURNER-VAUGHN
AND TAYLOR CO.
ENGINEERS AND MANUFACTURERS
CUYAHOGA FALLS OHIO. U.S.A.
1856

WIRE & CHAIN

All kinds and sizes

Fire-weld Process

MACHINERY

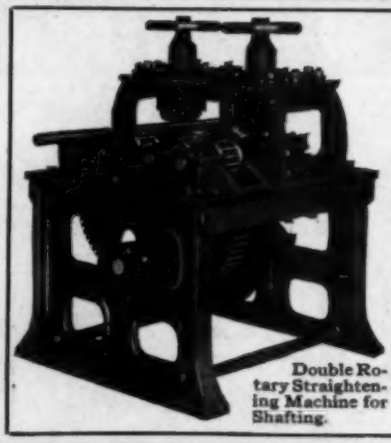
SAFE—ECONOMICAL—EFFICIENT

Years of experience at your service.

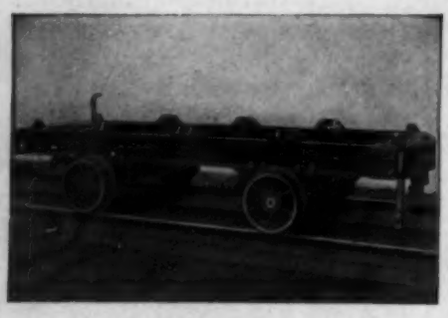
Tell us what you want to produce

Standard Engineering Co.
ELLWOOD CITY, PA., U. S. A.

Tube Mill Machinery (Seamless and Welded)
Rolling Mill Equipment
Rolls (sand and chilled)
Pipe Threading Machinery
Castings—gray iron, semi-steel, cupola, and air furnace
Machine work to drawings



Double Rotary Straightening Machine for Shafting.



CHARGING CAR

STEEL PLANT CONSTRUCTION

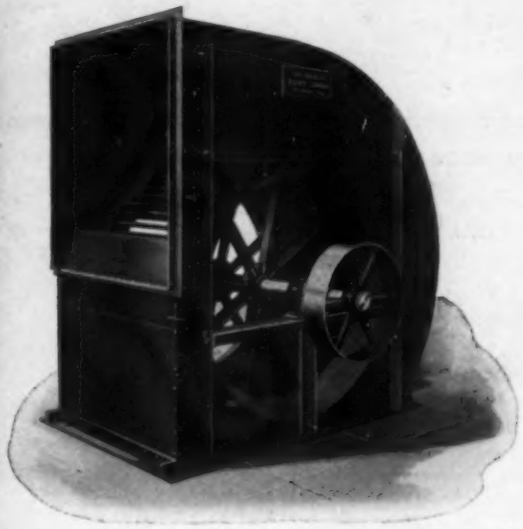
Open Hearth and Heating Furnaces
Foundations—Structural Steel Buildings
Crane Runways, etc.—Stacks and Flues
Oil Storage and Pressure Tanks—Miscellaneous Plate Work
Charging Cars and Boxes—Steel Ladles

W. W. LINDSAY & CO., INC.

2 South 15th St.
PHILADELPHIA, PA.

Give your men better air to breathe!

Men working in shops supplied with clean, pure air will work with more enthusiasm and energy than men working in an atmosphere laden with irritating dust particles or offensive odors.



BUCKEYE MULTIBLADE FAN

BUCKEYE

VENTILATING FANS AND SYSTEMS

will increase the efficiency of your plant—lengthen the life of your machines—reduce the danger from explosion and lower your insurance rates.

Put your ventilating problems up to our engineering department.

BUCKEYE BLOWER CO.
COLUMBUS, OHIO

ROUGH TURNING
OR
FINISH TURNING
FROM 1-IN. TO 4-IN.

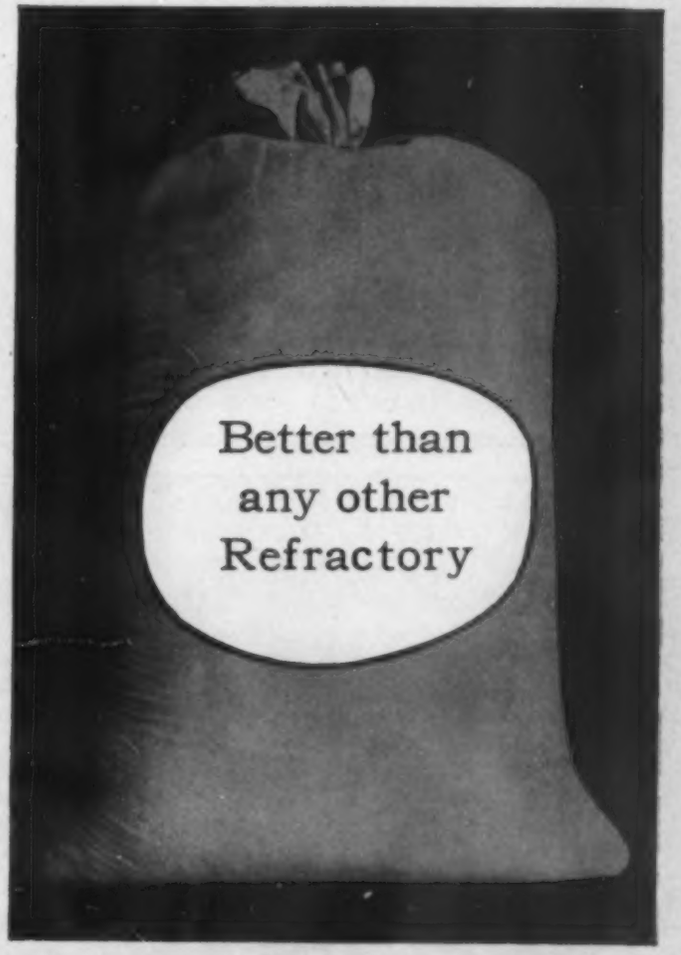
HEAT TREATING ANNEALING

BARS UP TO 22 FEET IN LENGTH

We are equipped with
Automatic Straightening Machines
For sizes from ⅜-in. to 4-in. Rounds

CASE HARDENING

The W. S. Bidle Co.
1411 E. 45th St.
CLEVELAND, OHIO

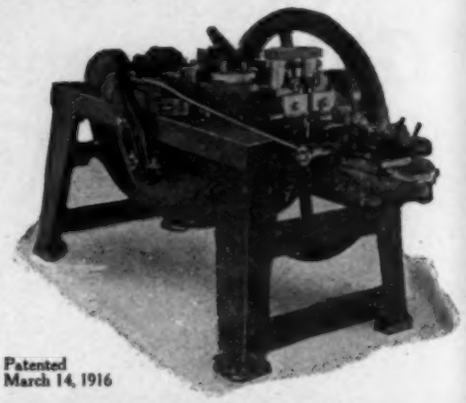


NAILS!—NOT NOISE!!

Helped Win the War!

The new and improved WIRE NAIL MACHINES with which we are equipping the trade are quiet, smooth-running, toggle-joint machines, with balanced mechanical motions and no rotating cams. They are PRACTICALLY NOISELESS IN OPERATION. Built in 5 sizes, handling wire from No. 18 to 3/8".

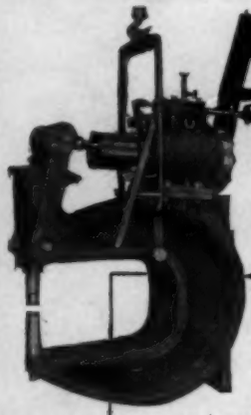
Ask for Bulletins 269, 350 and 351



Patented March 14, 1916

SLEEPER & HARTLEY, Inc.

Canadian Branch: COATICOOK, P. Q. WORCESTER, MASS.



ALLEN Riveters

THERE is no other type of riveting equipment that will do as fast and tight work as the ALLEN machines.

Allen service is distinctly superior and dependable. If your shop is not Allen equipped you are missing a reduction of riveting costs.

Write for latest catalog with full particulars.

JOHN F. ALLEN, CO.
372 Gerard Ave. NEW YORK

"Whatever the Riveting there's an Allen for the Job"

The final operation in the making of good steel bars should be to straighten them

on

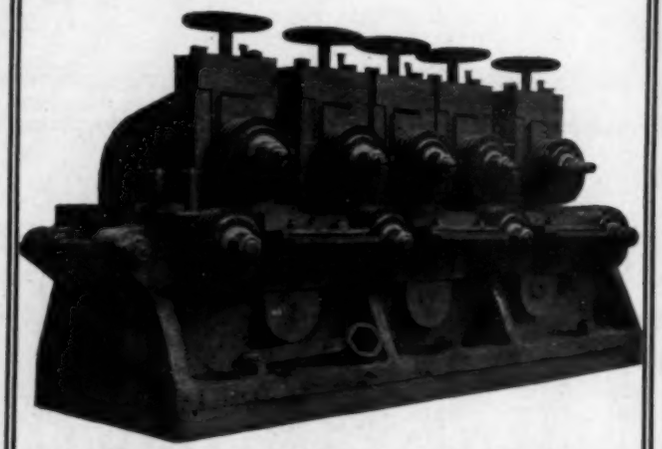
ABRAMSEN

STRAIGHTENING MACHINES

For straightening Shapes, Flats, Squares, and Hexagons.

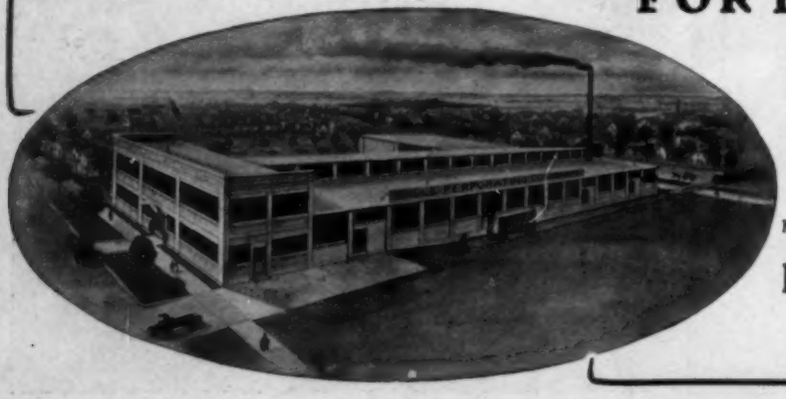
They guarantee perfect work at lowest cost.

We also manufacture Straightening Machines for Rounds from 1/4" to 6" in diameter.



Abramsen Engineering Co.
Union Bank Building - Pittsburgh, Pa.
Plant: Bellefonte, Pa.

OUR LOW PRODUCTION COSTS ENABLE US TO GIVE YOU—



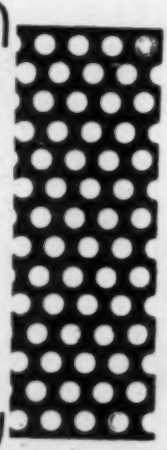
BETTER QUALITY FOR LESS MONEY

We are perforators of Aluminum, Brass, Copper, Steel, Tin, Zinc, etc., for threshing machines, fanning mills, pulp machinery, electrical devices, ventilators, grilles, coal and mining screens of all descriptions, and for hundreds of other purposes.

Our large stock of different sheet metals enables us to fill your orders promptly and at a minimum cost.

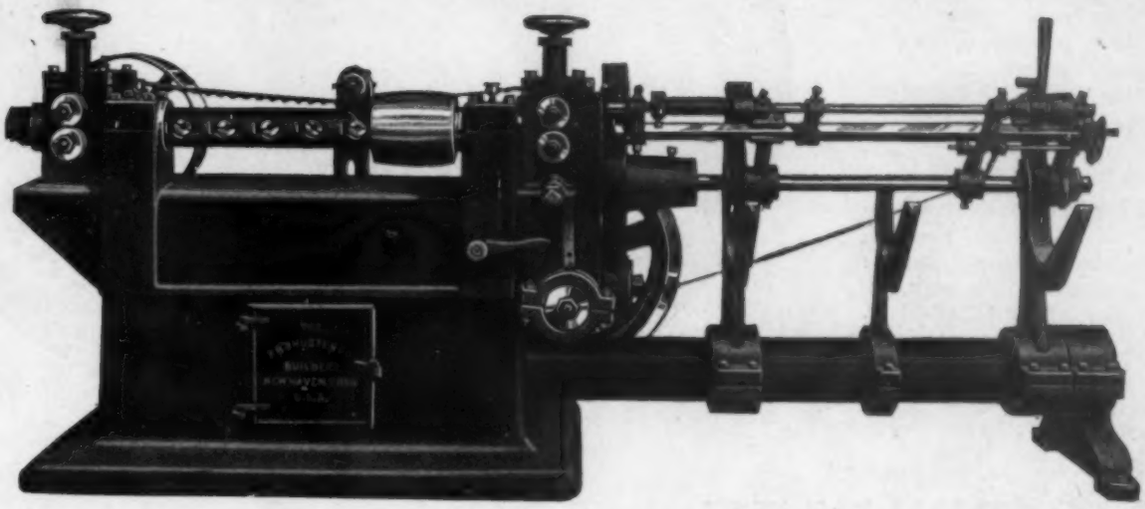
Ask us for a metal sample plate.

We Manufacture Perforated Steel for Machinery Guards and also carry a Stock of Perforated Steel.



Erdle Perforating Company
Rochester, New York
New Fire Proof Plant
Childs Street and B., R. & P. RY.

Wire Straightened and Cut



To accurate lengths, from the coil, at high speed in this

Automatic Wire Straightening and Cutting Machine

All kinds of wire may be handled without injury to the surface.

Skilled labor is not required, therefore the cost of operation is small, the machine practically taking care of itself.

Catalogue T with full particulars on request.

THE F. B. SHUSTER CO.

Formerly John Adt & Son **Established 1866**

New Haven - - - - Conn.

Also makers of Straighteners and Cutters for squares, hexagons, flats, etc.

SPEED

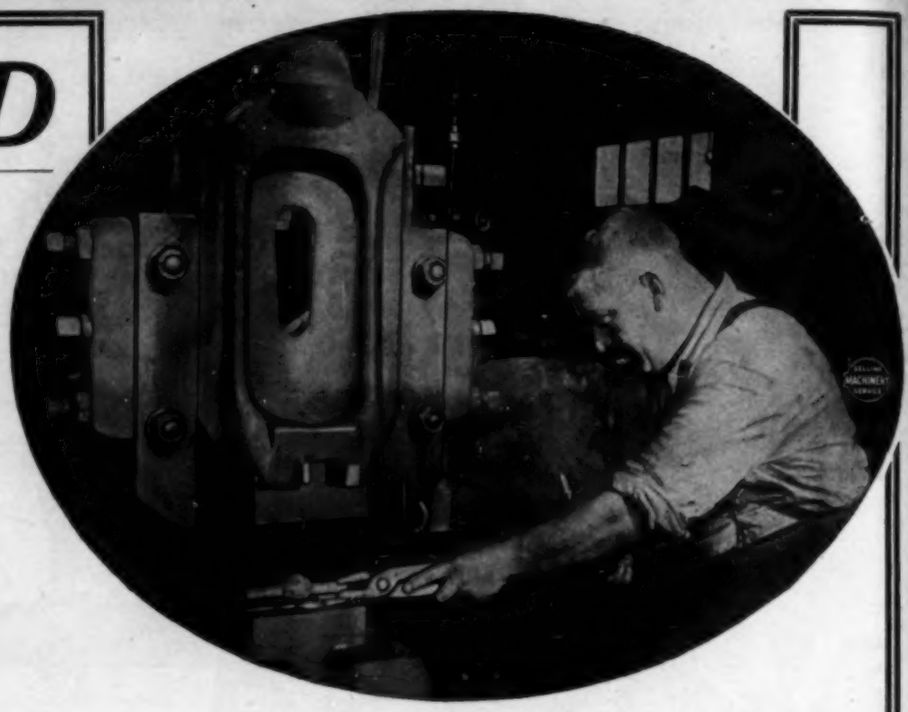
One of the chief reasons why many manufacturers substitute castings for forgings is because of the slow process of forging manufacture.

BRADLEY HAMMERS have revolutionized the forging business by adding speed.

They are also well adapted to drawing, swaging, collaring, welding, spindle making and die work.

Made in four types: Cushioned Helve, Upright Helve, Compact, Upright Strap.

Write for prices



C. C. BRADLEY & SON, Inc., Syracuse, N. Y.

FOREIGN AGENTS: England—Buck & Hickman, Whitechapel Road, London. France, Belgium, Switzerland, Spain, Portugal and Italy, Fenwick Freres & Co., Paris.

MACHINE TOOLS

Electric Travelling Cranes - Steam Hammers

NILES-BEMENT-POND CO.

GENERAL OFFICES, 111 BROADWAY, NEW YORK

BOSTON PHILADELPHIA BIRMINGHAM PITTSBURGH CINCINNATI CLEVELAND DETROIT CHICAGO ST. LOUIS SAN FRANCISCO

MILWAUKEE SHEARS

STEEL all STEEL

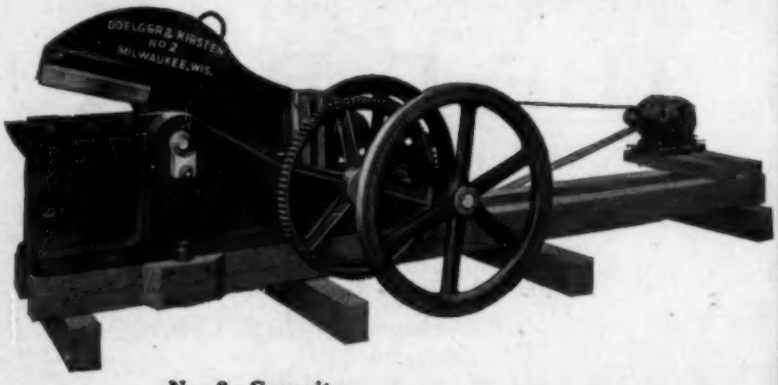
WHY BUY
Cast Iron or Semi-Steel
When You Can Buy All

STEEL SHEARS

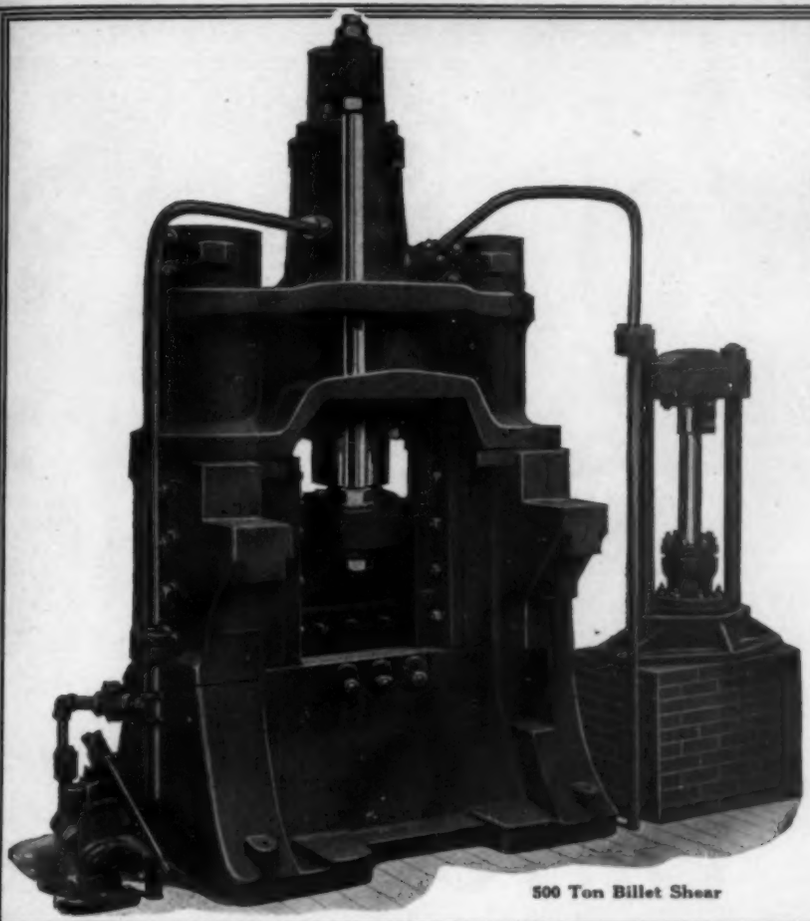
5 Sizes, up to 5 Inch Rounds

DOELGER & KIRSTEN

MILWAUKEE, WIS.



No. 2—Capacity



500 Ton Billet Shear

HYDRAULIC
AND
POWER SHEARS

For

Billets
Flats
Rounds
Angles
Plates

Also

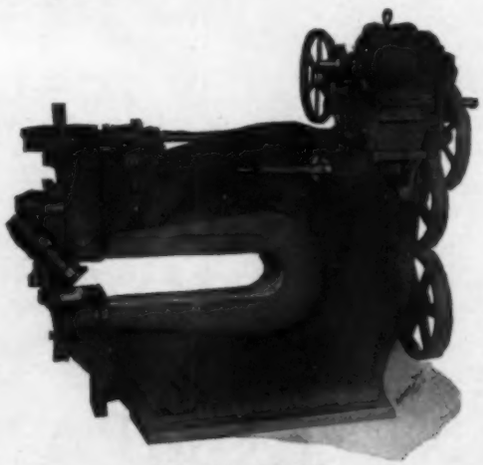
Benders
Punches
Plate Planers
Riveters

Southwark Foundry & Machine Co.
400 Washington Avenue
Philadelphia, Pa.

"QUICKWORK"
Registered U. S. Patent Office
ROTARY SHEARS
MADE IN 6 SIZES

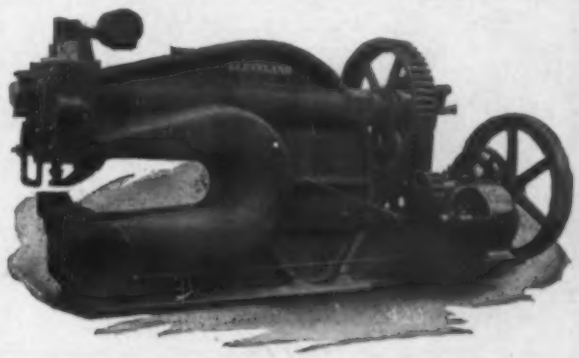
Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square true edge that requires no finishing.

Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 3rd, 1913

SAVE 50% TO 90%
Eliminates Oxyacetylene Cutting and Plate Planing.
Write for catalogue
THE QUICKWORK COMPANY, St. Marys, Ohio, U.S.A.



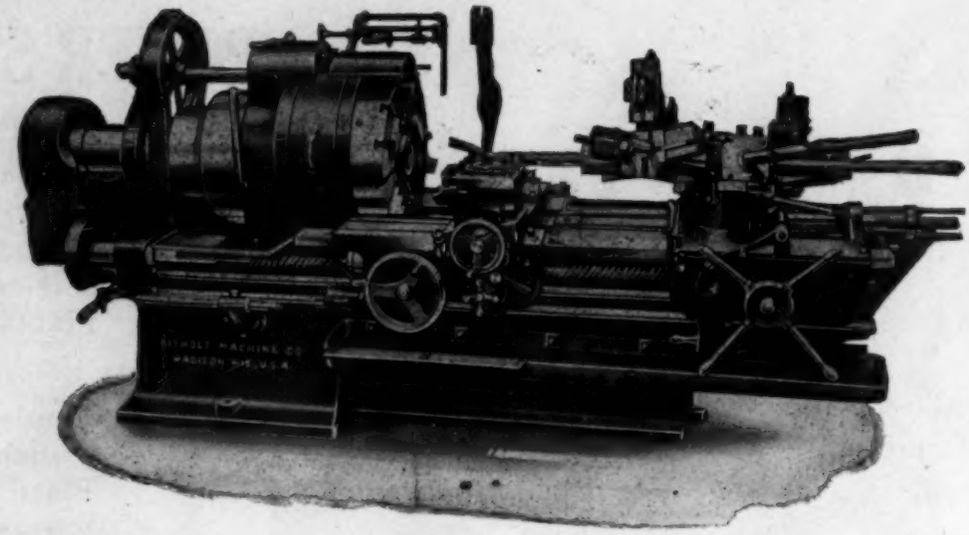
The "Cleveland" System

EVERY punching machine should be adapted to use standard tools both from the standpoint of economy and service.

You will eventually recognize the advantage of the Cleveland System as described in Cleveland Hand Book of Small Tools No. 6.

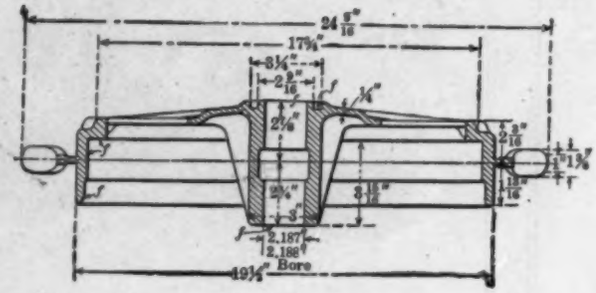
May we send you a copy?

The CLEVELAND PUNCH & SHEAR WORKS CO.
Main Office & Works CLEVELAND, OHIO
PITTSBURGH - CHICAGO - PHILADELPHIA - NEW YORK



Gisholt Turret Lathes

With Standard Tools



25 MINUTES EACH

Compare our production time with yours.

Tractor Wheels

Semi-Steel

Twenty-five Minutes Each

You can't beat Gisholt Turret Lathes for speed. This tractor wheel, machined as shown in twenty-five minutes, for example. Also, the comprehensive tooling system developed for and with the aid of Gisholt Turret Lathe users is a money saving proposition no lathe purchaser can afford to ignore.

GISHOLT MACHINE COMPANY,

Builders of Standard and Automatic Turret Lathes, Vertical and

Eastern Sales Office: 30 Church St., New York

AGENTS: Swind Machinery Co., Philadelphia; Ogden R. Adams, Rochester; J. L. Osgood, Buffalo; Chas. A. Strelinger, & Supply Co., St. Louis; Smith-Booth-Usher Co., Los Angeles; Fred. Ward & Son, San Francisco; Perine Machinery Co.,

Where You Find A

GISHOLT
Tool Grinder

You'll Find Properly Ground Tools

And where you find properly ground tools at the machines, ready for use the instant they are needed, you will find all machines busy, as the operators do not have to leave their machines standing idle while they go to sharpen their tools.

The Gisholt Tool Grinder is more than a grinding machine. The direct benefits are far reaching.

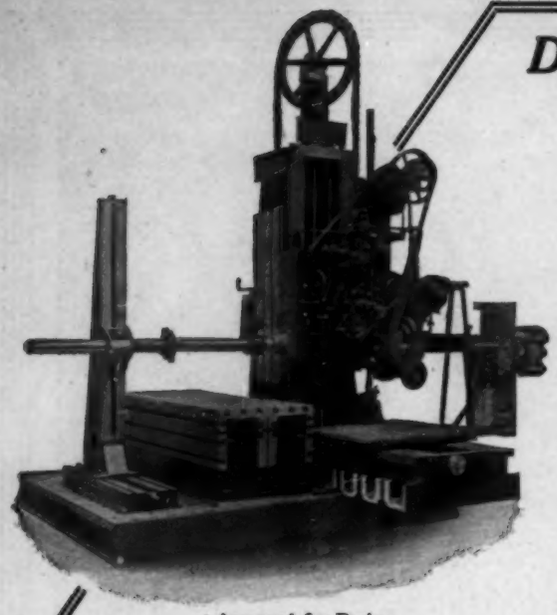
Let us tell you the complete story and show you what this machine has done for some of its purchasers.

1153 East Washington Ave., MADISON, WIS., U.S.A.

Horizontal Boring Mills, Tool Grinders, Small Tools, Special Machinery, etc.

Works: Madison, Wis.; Warren, Pa.

Co., Detroit; Vonnegut Machinery Co., Indianapolis; Stocker-Rumely-Wachs Co., Chicago; Colcord-Wright Machinery Seattle; Portland Machinery Co., Portland; P. H. McArdle, New Orleans; Canadian Fairbanks-Morse Co., Canada.



Arranged for Boring

Do all the work on one machine!

The planing, facing, milling and boring required on a casting can all be done by one machine if you use the MORTON TRAVELING HEAD PLANER.

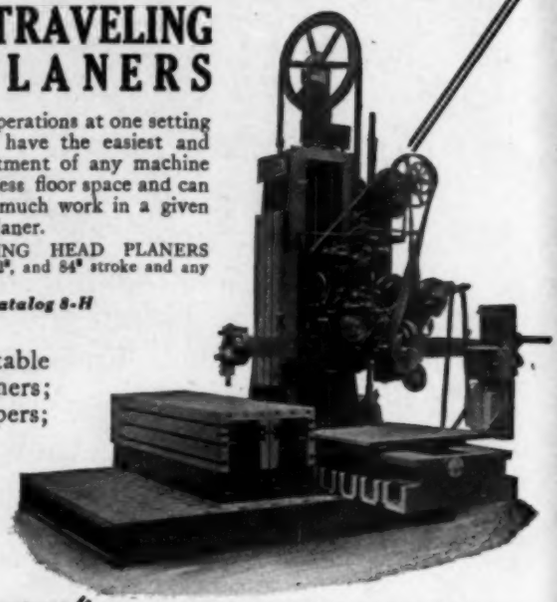
The "Morton" can be used either as a stationary or portable machine, for horizontal or vertical work and can be reversed quickly from a draw to a push cut.

MORTON TRAVELING HEAD PLANERS

will perform several operations at one setting of the work. They have the easiest and quickest stroke adjustment of any machine made; they occupy less floor space and can accomplish twice as much work in a given time as any housed planer.

MORTON TRAVELING HEAD PLANERS are made with 48", 60", 72", and 84" stroke and any length bed.

Ask for catalog 8-H



Arranged for Vertical Milling and Boring

We also manufacture Stationary Keyway Cutters; Portable Keyway Cutters; Portable Planers; Draw Cut Pillar Sharpeners; Portable Anvil Block Shapers; Special Steel Foundry Shapers; and Roll Wabble Shapers.

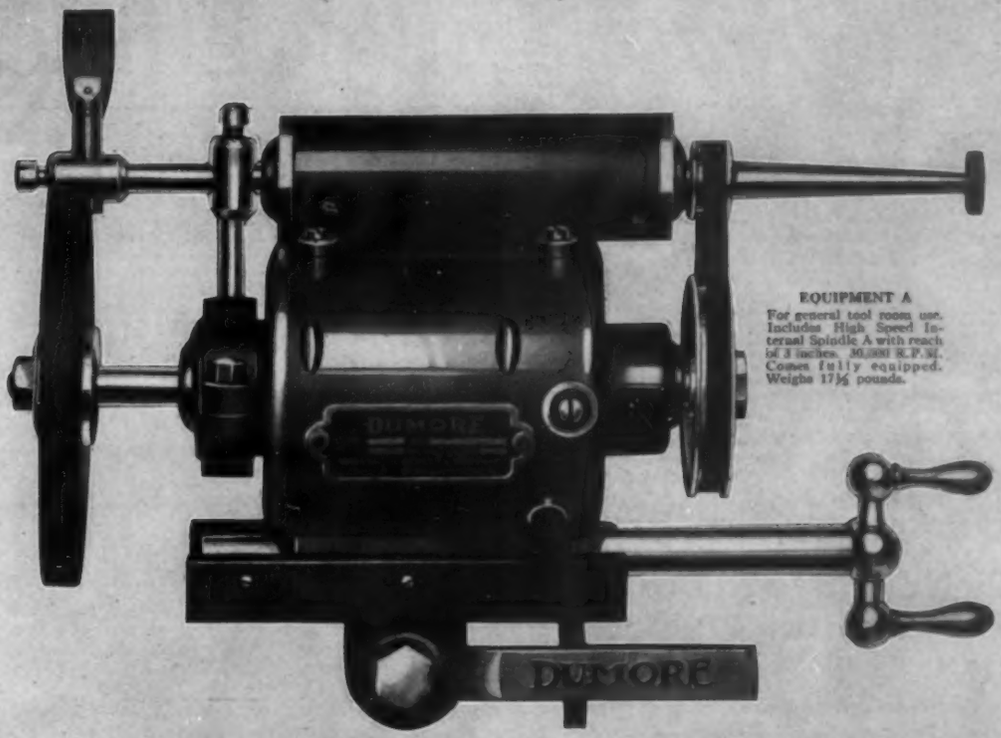
Morton Manufacturing Company
Muskegon Heights MICH., U. S. A.

The Means to Victory

¶ Now that we have been successful in the conduct of the war, our task has just begun. The whole world looks to us for aid in the reconstruction, for a new development. We have shown the world our ability to prepare.

¶ That ability which was manifested by ourselves, along with other concerns, splendidly equips us to aid in reconstruction and development. Our facilities to produce machinery of large size for the production of varied requirements is yours to command. We solicit the building of special machinery with a confidence born of accomplishment. Address

Amalgamated Machinery Corporation
72 West Adams Street
CHICAGO



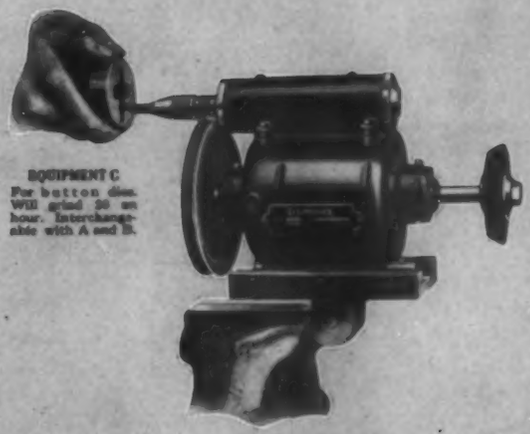
EQUIPMENT A
For general tool room use. Includes High Speed Internal Spindle A with reach of 3 inches. 30,000 R.P.M. Comes fully equipped. Weighs 17½ pounds.

THE vital need felt in all tool-rooms and repair shops for a portable grinder that will give absolutely accurate results is answered by the **DUMORE**.

Here is a tool of many uses—one which reduces operating costs and gives a very high standard of efficiency. Perfect running balance combined with speeds ranging from 10,000 to 50,000 R. P. M. give the **DUMORE** domination of the portable grinding field.

Write for complete information.

WISCONSIN ELECTRIC CO.
3506 16th Street RACINE, WIS.



EQUIPMENT C
For button dies. Will grind 20 an hour. Interchangeable with A and B.

EQUIPMENT B
For deep internal work. Extension arm has 10-inch reach. 40,000 R.P.M. Arm interchangeable with internal spindle on Equipment A.

DUMORE HIGH SPEED GRINDERS

"Hunter" Cutting Efficiency

If you wish to make RECORDS for both speed and *efficiency*, you should lose no time in getting *Hunter "Duplex" Saw Service* into your plant.

There are hundreds of concerns "Cashing in" heavily every day, on just a small Hunter "Duplex" Investment.

Full Particulars Upon Request.

WE SPECIALIZE

Hot Saws; Friction Discs; Solid Blades made of Vanadium; Tungsten and Chrome Alloy Steels; Saw Sharpening Machines; Inserted Tooth Grinders; Hardened Steel Specialties.

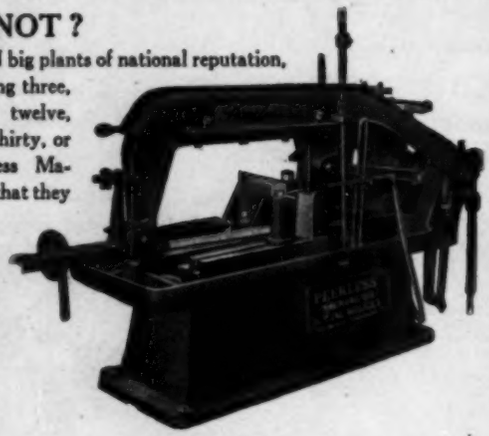
Hunter Saw & Machine Co.
PITTSBURGH, PA.

Peerless HIGH SPEED

THE NEW STANDARD
Increases Production 50 to 100%

WHY NOT?

WHEN big plants of national reputation, who are using three, six, eight, twelve, and up to thirty, or more Peerless Machines, say that they increase production from 50 to 100%, saving in time, labor, blades and expensive material.



AND WHEN we are willing to have you try out the Peerless for 30 days at our own risk and expense, we paying freight both ways if it fails to make good.

THEN WHY NOT try it out for yourselves, when the gain is more yours than ours if it makes good, and if it fails the loss is ours alone?

PEERLESS MACHINE CO.
1605 Racine Street RACINE, WISCONSIN

MOLTRUP'S FINISHED MACHINE KEYS

Leaders for over a quarter of a century.

Standard Gib Head; Cut Under Gib Head; Plain Taper; Round End Feather; Special Keys for every class of work;

also

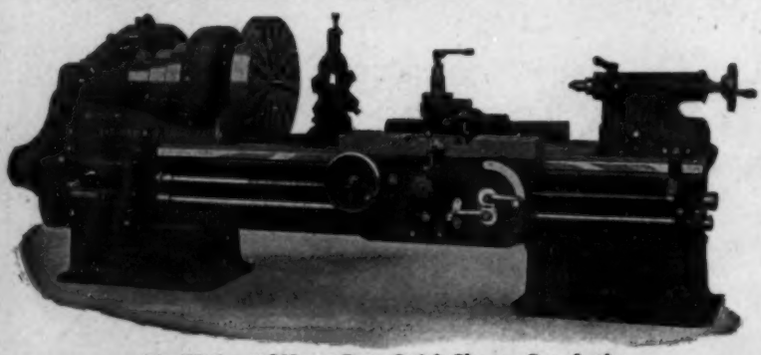
Machine Rack; Flattened Ground Steel Plates and Discs; Engraving Plates; Cold Drawn Steel; Rounds; Hexagons; Flats; Squares;

Write for prices

Moltrup Steel Products Co.
Beaver Falls, Pa.

AGENCIES:
Central Steel & Wire Co., Chicago and Detroit
Edgar T. Ward's Sons Co., Boston
H. D. Cushman Co., Cleveland
Milton Pray, Monadnock Bldg., San Francisco, Cal.
Messrs. Pray & Fortier, Alaska Bldg., Seattle, Wash.
Milton Pray, Higgins Bldg., Los Angeles, Cal.

WICKES HEAVY DUTY ENGINE LATHE



The Wickes 26" Heavy Duty Quick Change Gear Lathe

Built in lengths from 8 ft. up. Has 3-step cone, is double back geared and has double plate apron.

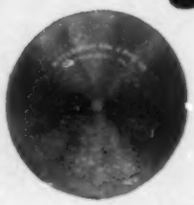
This tool is built for the most severe service; all parts liberal in size; has special ball thrust bearings; steel apron gears; coarse pitch and wide face gears, which are all well guarded. Let us tell you about this lathe and also our 18", 32" and 36" machine.

We can make prompt shipments.

WICKES BROTHERS
SAGINAW, MICH.

AGENTS—Wickes Bros., Seattle, Wash. Rolph Mills & Co., San Francisco, Cal. Rolph Mills & Co., Los Angeles, Cal. Machine Tool Sales Co., Pittsburg, Pa. Badger Packard Machy. Co., Milwaukee, Wis.

Pittsburgh Saws



make faster sawing a simple task

Slitting Saws; Milling Saws; Hot Saws; High Speed Friction Disc Saws; Tube Saws; Pipe Cutters; Slate Saws; Cork Knives; Simplex Inserted Tooth Saws, etc.

Let us know your requirements.

Write for Catalog

Pittsburgh Saw & Mfg. Co.

32nd and Smallman Sts. Pittsburgh, Pa.

For the sake of Economy

use RACINE HIGH SPEED Metal Cutting Machines

They cut faster, are easier on saw blades and do not waste stock.

The Saw frame holds itself automatically at any height, making it very convenient when placing stock into the machine.

Racine High Speed Metal Cutting Machines are made for every Metal Cutting purpose.

Let us know your requirements

Racine Tool and Machine Company

RACINE, WIS., U. S. A.

Write for special catalog "D"

Shoot the Counterweights and Save Your Neck

Yes, and save your ropes.

The Ridgway Elevator is self-counterbalancing.

The water that operates it counterbalances it.

Our big ten ton machines with platforms 10 x 20 feet don't even require counterbalances.

THIS ONE FEATURE SHOULD DECIDE ANY SMART MAN

The inertia of a big counterweight is something fierce. It disintegrates the counterweight ropes and their renewal is costly.

The counterweight ropes go far toward paying interest on a Ridgway Elevator.

Say, haven't you noticed that in passenger elevators they have the counterweights on an air cushion.

Never thought of it before, did you?

Yes, and isn't safe and economical freight service as important in your factory

As passenger service in hotel or office building.

Well, I guess!

There are a hundred reasons why 2000 concerns like these

Yale & Towne Mfg. Co.	Procter & Gamble Co.	John Wanamaker
Remington Typew'trCo.	Packard Motor Car Co.	Standard Oil Co.
Cluett, Peabody Co.	H. J. Heinz Co. (57)	Welsbach Light Co.
American Tobacco Co.	John Morrell & Co.	Sherwin, Williams & Co.
Continental Gin Co.	Federal Sugar Co.	United Gas Imp. Co.
B. F. Goodrich Co.	Pennsylvania R. R. Co.	International H'v'er Co.
Am. Smelt. & Refin. Co.	General Electric Co.	Midvale Steel & Ord. Co.

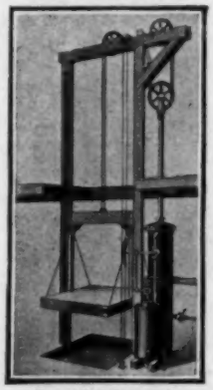
"Hook 'er to the Biler."

CRAIG RIDGWAY & SON - Coatesville, Pa.

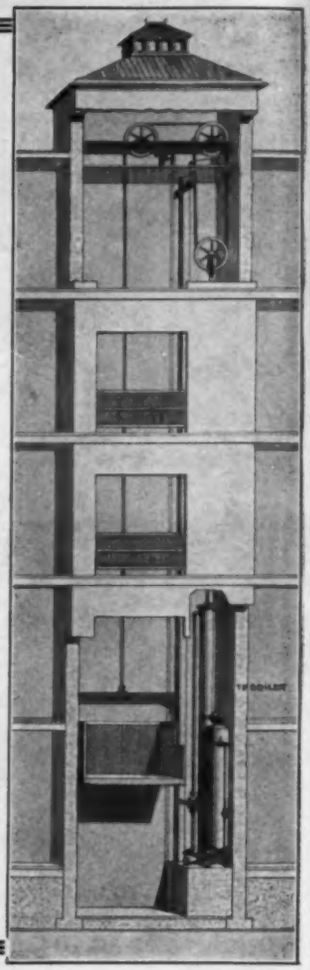
ELEVATOR MAKERS TO FOLKS WHO KNOW

Direct Acting

Over 2000 in Daily Use



Double Geared



WAREHOUSE SERVICE FOR THE EAST

FOR THE CONVENIENCE OF THE TRADE WE ARE CARRYING IN OUR

BOSTON WAREHOUSE

THE LARGEST AND MOST COMPLETE STOCK OF COLD FINISHED STEELS IN THE EAST. WILL CUT TO ANY SPECIAL OR SHORT LENGTHS.

COLUMBIA STEEL & SHAFTING CO.

Mills and General Offices, PITTSBURGH, PA.

Eastern Sales Department and Warehouse BOSTON, MASS.

Sales Offices: CHICAGO—CLEVELAND—DETROIT—NEW YORK—PHILADELPHIA—WASHINGTON

AMERICAN BRIDGE COMPANY

HUDSON TERMINAL-30 CHURCH STREET, NEW YORK

Manufacturers of Steel Structures of all classes particularly BRIDGES AND BUILDINGS

Sales Offices

NEW YORK, N. Y.	*30 Church Street*
Philadelphia, Pa.	*Widener Building*
Boston, Mass.	*John Hancock Building*
Baltimore, Md.	*Continental Trust Building*
PITTSBURGH, PA.	*Frick Building*
Buffalo, N. Y.	*Marine National Bank*
Cincinnati, Ohio	*Union Trust Building*
Atlanta, Ga.	*Candler Building*
Cleveland, Ohio	*Guardian Building*
Detroit, Mich.	*Beecher Ave. & M. C. R. R.*
CHICAGO, ILL.	*208 South La Salle Street*
St. Louis, Mo.	*Third National Bank Building*
Denver, Colo.	*First National Bank Building*
Salt Lake City, Utah	*Walker Bank Building*
Duluth, Minn.	*Wolvin Building*
Minneapolis, Minn.	*7th Ave. & 2nd St., S. E.*

Pacific Coast Representative

U. S. Steel Products Company, Pacific Coast Department

San Francisco, Cal.	*Rialto Building*
Portland, Ore.	*Selling Building*
Seattle, Wash.	*4th Ave. So., Cor. Conn. St.*

Export Representative

United States Steel Products Company . . 30 Church St., N. Y.

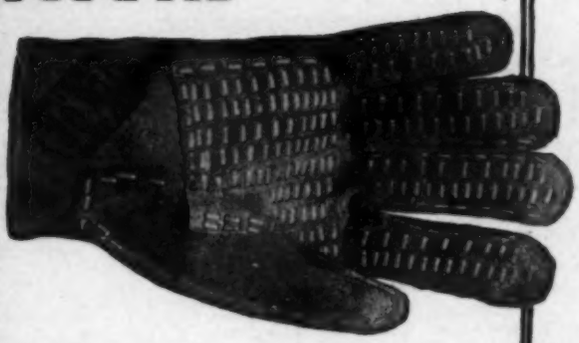
NATION WIDE STEEL-SERVICE

CHICAGO NEW YORK ST. LOUIS DETROIT

ESTABLISHED IN CHICAGO IN 1842.
OUR EXPERIENCE COVERS SEVENTY FIVE YEARS IN SUPPLYING THE NEEDS OF THE MANUFACTURING INDUSTRIES AND TODAY WE OFFER PROMPT SHIPMENT FROM STOCK OF PLATES, BARS, STRUCTURALS, SHEETS, TUBES AND ALLIED REQUIREMENTS IN IRON AND STEEL PRODUCTS.

JOSEPH T. RYERSON & SON
IRON STEEL MACHINERY

Steel-Grip Industrial Gloves and Mittens—



No. 605—$10.20 per doz. (or all lefts or rights)

No. 678—$8.40 per doz. (or lefts or rights)

Better Work At Less Glove Cost

Steel-Grip Gloves and Mittens fit the spirit of the times. They save workers' hands and cut glove costs.

The patented Steel-Grip reinforcement of palm, fingers and thumb means thorough protection and top speed production. The worker forgets his hands and just digs in. Equally as important—Steel-Grips cut glove costs. They wear so much longer than ordinary gloves that they win out for economy by a big margin.

The patented reinforcing does not interfere with flexibility or comfort. Steel-Grips are popular both with the worker and the purchasing agent—for both get what they are looking for. A trial of these better industrial gloves will convince you.

Sole Manufacturers

Hickory Steel Grip Glove Co.

Box R-6

Chicago Illinois

No. 605—Extra long wearing, reinforced with leather patch on palm and steel ribbons. Steel sewed. **$10.20** per dozen pairs (or all rights or lefts).

No. 678—Two mitts for price of one. Reversible and worn on either hand. No reinforcement, but steel sewed. **$8.40** per dozen pairs.

"Where-To-Buy"

A classified-by-products list of advertisers for the convenience of readers. If you don't find what you want, write us and we will tell you where to get it. ¶ Index to advertisements will give you page number of any advertiser and by referring to advertisement you can get full particulars about products.

ACCUMULATORS
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wood, R. D., & Co., Philadelphia, Pa.

ACETYLENE IN CYLINDERS
Air Reduction Co., 120 Broadway, New York City.
Davis-Bournonville Co., Jersey City, N. J.
Linde Air Products Co., New York City.

ADAMITE ROLLS
Pittsburgh Iron & Steel Foundries Co., Pgh.

AIR COMPRESSORS
General Electric Co., Schenectady, N. Y.
Wickes Brothers, Dept. A., Saginaw, Mich.

AIR SEPARATORS
Raymond Bros. Impact Pulveriser Co.,
1813 N. Branch St., Chicago, Ill.

ALLOYS
American Vanadium Co., Pittsburgh, Pa.
Blackwell, Geo. G., Sons & Co., Ltd.,
Liverpool, Eng.
Central Steel Co., The, Massillon, O.
Haynes Stellite Co., The, Kokomo, Ind.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
United Alloys Steel Corp., Canton, O.
United States Alloys Corp., 28 E. 42d St., N. Y. C.

ALLOYS (Boronic All-Metal in Shot Form)
American Boron Products Co., Inc.,
686 Court St., Reading, Pa.

ALUMINUM (Boronic All-Metal in Shot Form)
American Boron Products Co., Inc.,
686 Court St., Reading, Pa.

ALUMINUM (Vanadium)
American Vanadium Co., Pittsburgh, Pa.

ALUMINUM ALLOY
United Smelting & Al. Co., New Haven, Conn.

ALUMINUM GRANULATED
United Smelting & Al. Co., New Haven, Conn.

ALUMINUM INGOTS
United Smelting & Al. Co., New Haven, Conn.

ANCHORS (Steel Stockless)
Columbia Steel Co., San Francisco, Cal.
Penn Seaboard Stl. Corp., Franklin Bk. Bldg., Phila.

ANGLES, TEES, CHANNELS (See Steel, Structural)

ANNEALERS (Pot and Muffle)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

ANNEALING
Bidle, W. S., Co., 1411 E. 45th St., Cleveland, O.

ANNEALING BOXES AND POTS
Farrell-Cheek Steel Foundry Co., Sandusky, O.
Garwood Bronze & Iron Works, Garwood, N. J.
Hammond Malleable Iron Co., Hammond, Ind.
Ohio Steel Foundry Co., The, Springfield, O.
Pgh. Annealing Box Co., 320 Beaver Ave., Pgh.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Smith, Geo. H., Steel Castings Co., Milwaukee.
United Engrg. & Foundry Co., Pittsburgh, Pa.
Zanesville Malleable Iron Co., Zanesville, O.

ANTIMONY
United Smelting & Al. Co., New Haven, Conn.

ANTI-SLIP TREADS FOR STAIRS
Pittsburgh Iron & Steel Foundries Co., Pgh.

ARCHITECTURAL SHAPES
Empire Art Metal Co., College Pt., N. Y.

ARMATURES
Duquesne Electric & Mfg. Co., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., E. Pgh., Pa.

ASBESTOS CLOTHING
Holcomb Safety Garment Co., The,
14 So. Jefferson St., Chicago, Ill.

AUTO TRUCKS
Federal Motor Truck Co., Detroit, Mich.

AXLE LATHES
Bridgeford Machine Tool Works,
186 Whiton Rd., Rochester, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.

AXLES
American Bridge Co., New York City
American Steel Export Co., New York City
Bay City Forge Co., Erie, Pa.
Camden Forge Co., Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Donner Steel Co., Inc., Buffalo, N. Y.
Illinois Steel Co., Chicago, Ill.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.

BABBITT METAL
Keystone Bronze Co., Pittsburgh, Pa.
Lubricating Metal Co., 2 Rector St., N. Y. C.
Merchant & Evans Co., Philadelphia, Pa.
United Smelting & Al. Co., New Haven, Conn.

BAKERS, WIRE COATING
Morgan Construction Co., Worcester, Mass.

BAKERS (Wire Coating and Bluing)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BALLS (Brass and Bronze)
Auburn Ball Bearing Co.,
30 Elizabeth St., Rochester, N. Y.
Hoover Steel Ball Co., Ann Arbor, Mich.

BALLS (Steel)
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.
Hoover Steel Ball Co., Ann Arbor, Mich.
New Departure Mfg. Co., Bristol, Conn.

BANDS (Forged Steel)
Akron-Selle Co., The, Akron, O.

BANDS (Iron)
Lockhart Iron & Steel Co., Pittsburgh, Pa.

BAND (Steel)
Carnegie Steel Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Sharon Steel Hoop Co., Sharon, Pa.

BANKS
First National Bank of Boston, Boston, Mass.

BAR STOCK RACKS
New Britain Machine Co., New Britain, Conn.

BARBED WIRE FENCE (Equipment)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BARGES (Steel)
American Bridge Co., New York City.

BARREL SAND BLASTS
Pangborn Corporation, Hagerstown, Md.

BARS AND BILLETS (Tool Steel)
General Steel Co., Milwaukee, Wis.

BARS (Boring)
Gisholt Machine Co., Madison, Wis.

BARS (Charcoal Iron)
Carnahan Tin Plate & Sheet Co., Canton, O.

BARS (Concrete Reinforcing)
Bethlehem Steel Co., Bethlehem, Pa.
Franklin Steel Works, Franklin, Pa.
Inland Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
Pacific Coast Steel Co., San Francisco, Cal.

BARS (High Speed Steel)
General Steel Co., Milwaukee, Wis.
Onondaga Steel Co., Syracuse, N. Y.

BARS (Iron and Steel)
Amalgamated Products Co., 165 Broady., N. Y. C.
American Bridge Co., New York City
American Steel Export Co., New York City
Amiron Supply Co., Inc., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Cambria Steel Co., Philadelphia, Pa.
Camden Forge Co., Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Donner Steel Co., Inc., Buffalo, N. Y.
Federal Export Corp., 42 Broadway, N. Y. C.
Franklin Steel Works, Franklin, Pa.
Harvey, Arthur C., Co., Boston, Mass.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago, Ill.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co.,
104 S. Michigan Ave., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Liberty Steel Products Co., New York
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Milton Mfg. Co., Milton, Pa.
Pacific Coast Steel Co., San Francisco, Cal.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co.,
Suite 1127 New Continental & Commercial Bank Bldg., Chicago
Shippers Car Line, New York, N. Y.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & R. R. Co.,
Birmingham, Ala.
United Alloys Steel Corp., The, Canton, O.
Vulcan Steel Products Co., 120 Broadway, N. Y. C.
Ward's Edgar T., Sons Co.,
44 Farnsworth St., Boston, Mass.
Youngstown Sheet & Tube Co., Youngstown, O.

BARS (Tin)
Andrews Steel Co., Newport, Ky.

BATTERY CHARGING EQUIPMENT
Cutler-Hammer Mfg. Co., Milwaukee, Wis.

BEAMS, CHANNELS AND ANGLES
American Steel Export Co., New York City
Belmont Iron Works, Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Chesapeake Iron Works, Baltimore, Md.
Empire Art Metal Co., College Pt., N. Y.
Federal Export Corp., 42 Broadway, N. Y. C.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., The, Chicago, Ill.
Liberty Steel Products Co., New York
Pacific Coast Steel Co., San Francisco, Cal.
Scully Steel & Iron Co., Suite 1127 New Continental & Commercial Bank Bldg., Chicago.
Shippers Car Line, New York, N. Y.
Snead Architectural Iron Works, Louisville, Ky.
Tennessee Coal, Iron & R. R. Co.,
Birmingham, Ala.
Vulcan Steel Products Co., 120 Broadway, N. Y. C.

BEARING STEELS (Chrome)
General Steel Co., Milwaukee, Wis.

BEARINGS (Ball)
Auburn Ball Bearing Co.,
30 Elizabeth St., Rochester, N. Y.
New Departure Mfg. Co., Bristol, Conn.

BEARINGS (Roller)
Hyatt Roller Bearing Co., Industrial Bearing Division, Metropolitan Tower, New York

BELT CEMENT AND DRESSING
Dixon, Joseph, Crucible Co.,
Dept. 64-B, Jersey City, N. J.
Graton & Knight Mfg. Co., Worcester, Mass.
Texas Co., Dept. T., 17 Battery Pl., N. Y. C.

BELT LACING (Leather)
Chicago Rawhide Mfg. Co., 1301 Elston Av., Chicago

BELT LACING (Steel)
Flexible Steel Lacing Co., 522 S. Clinton St., Chgo.

BELTING (Chain)
Link-Belt Co., Chicago, Ill.

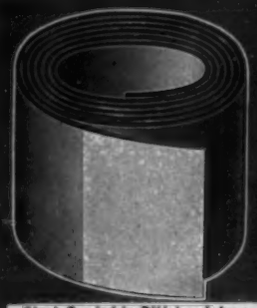
BELTING (Leather)
Chicago Rawhide Mfg. Co., 1302 Elston Av., Chicago
Graton & Knight Mfg. Co., Worcester, Mass.

BENCHES AND FRAMES (Drawing)
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., The, Cuyahoga Falls, O.

BENCH LEGS (All Steel)
New Britain Machine Co., New Britain, Conn.

BENDING AND STRAIGHTENING MACHINES
Abramsen Engrg. Co., Pittsburgh, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Espen-Lucas Mch. Wks., Front and Girard, Phila.
Hinman, D. A. & Co., Sandwich, Ill.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

BENZOL RECOVERY PLANTS
Koppers Co., The, Pittsburgh, Pa.



A BELTING FOR HARD SERVICE

Most large users recognize the superior strength of fibre, and the greater durability of

VULCANITE KROME LEATHER

Tanned and manufactured exclusively by

THE CHICAGO RAWHIDE MFG. CO.
1301 ELSTON AVENUE, CHICAGO, ILL.

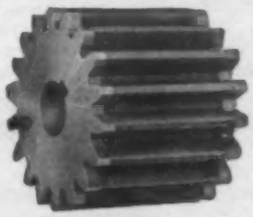
Stock Carried in Pittsburgh by J. FRANK LANNING & CO. 914 Union Bank Bldg. Pittsburgh, Pa.

In Los Angeles by W. K. THOMPSON 228 W. 4th St. Los Angeles, Calif.

CHAMBERSBURG
STEAM HAMMERS
HYDRAULIC MACHINERY
Built in all sizes for every class of work.
ECONOMICAL—RELIABLE—EFFICIENT
CHAMBERSBURG ENGINEERING CO., Chambersburg, Pa.

THE GENERAL ELECTRIC COMPANY
Has a motor for every service, a controller for every motor and skilled engineers to apply them to the best advantage.
General Office: SCHENECTADY, N. Y.
Sales Offices in All Large Cities
43-1

THE C. & G. COOPER CO.
Mt. Vernon, Ohio
ENGINE BUILDERS
Corliss Engines - 50 to 10,000 H.P.
Gas Engines - - 100 to 3,000 H.P.
Heavy Special Machinery, including Rope Wheels, Mills, etc.



The Silent Running
Peerless Rawhide Pinions
Accurate *Efficient* *Durable*
Are being used today with great success in many of the largest shops.
We also manufacture all styles and sizes of METAL GEARS.
Write Us
THE HORSBURGH & SCOTT CO.
5114 Hamilton Ave. N. E., CLEVELAND, OHIO

ROLLS

EXCLUSIVELY FOR ALL PURPOSES

MASSILLON
Single Frame—Double Frame
and
STEAM DROP HAMMERS
The Massillon Foundry & Machine Co.
Massillon - - - Ohio

Lewis Foundry & Machine Co.
PITTSBURGH, PA., U. S. A.
WE CAN MAKE PROMPT DELIVERY
of
Chilled and Sand Rolls, Rolling Mill Equipment, Gear Drives, Roll Trains, Shears, Roll Lathes, Punches, Etc.
Consult Our Engineer If Planning Improvements

BILLETS AND BLOOMS
American Steel Export Co., New York City.
Andrews Steel Co., Newport, Ky.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Central Steel Co., The, Massillon, O.
Donner Steel Co., Inc., Buffalo, N. Y.
Federal Export Corp., 42 Broadway, New York City
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Liberty Steel Products Co., New York
Mudge, Edmund W., & Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
United Alloy Steel Corp., Canton, O.
Whitaker-Glessner Co., Wheeling, W. Va.
Wickwire Steel Co., Buffalo, N. Y.
Wood, Alan, Iron & Steel Co., Philadelphia

BINS (Steel)
Empire Art Metal Co., College Pt., N. Y.

BLAST FURNACE EQUIPMENT
Mackintosh-Hemphill & Co., Pittsburgh, Pa.

BLAST FURNACE TUYERES
Keystone Bronze Co., Pittsburgh, Pa.

BLAST FURNACE VOLUME METERS
Clark, Chas. J., Chicago, Ill.

BLAST GATES
Rockwell, W. S., Co., 50 Church St., N. Y. C.

BLOCKS (Creosoted Wood)
Rodd Co., The, Century Bldg., Pittsburgh, Pa.

BLOCKS (Wood Flooring)
Jennison-Wright Co., 2485 Broadway, Toledo, O.
Republic Creosoting Co., Indianapolis, Ind.
Rodd Co., The, Century Building, Pittsburgh, Pa.

BLOOMS (Charcoal)
Carnahan Tin Plate & Sheet Co., Canton, O.

BLOWERS
Buckeye Blower Co., Columbus, O.
Connersville Blower Co., The, Connersville, Ind.
Roots, P. H., & F. M., Co., Connersville, Ind.
Westinghouse Elec. & Mfg. Co., E. Pgh., Pa.

BLUE PRINTING MACHINES (Electric)
Wickes Brothers, Dept. A, Saginaw, Mich.

BOILER COVER
Magnesia Association of America, The, Bulletin Bldg., Philadelphia

BOILER AND ENGINE ROOM SUPPLIES
Carpenter, Geo. B., & Co., Dept. 26, Chicago.

BOILER INSULATION
Armstrong Cork & Insulation Co., 101 Twenty-fourth St., Pittsburgh

BOILER SETTINGS
Brighton Fire Brick Co., New Brighton, Pa.

BOILER TUBES
Amalgamated Products Co., 165 Broadway, N. Y. C.
Detroit Seamless Steel Tubes Co., Detroit
National Tube Co., Pittsburgh, Pa.

BOILERS (Second Hand)
Parsons, Henry T., Pittsburgh, Pa.

BOILERS AND SUPERHEATERS
Babcock & Wilcox Co., The, New York City
Davis, J. F., Chicago, Ill.
Erie City Iron Works, Erie, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Uniflow Boiler Co., Philadelphia, Pa.
Vulcan Iron Wks., 1739 Main St., Wilkes-Barre, Pa.
Wickes Brothers, Dept. A, Saginaw, Mich.

BOLT CUTTERS
New York Machinery Exchange, Inc., N. Y. C.

BOLT AND NUT MACHINERY
Baker Bros., Toledo, O.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, O.
Newton Machine Tool Works, Inc., 23rd and Vine St., Philadelphia
Webster & Perks Tool Co., P. O. Box 1200, Springfield, O.

BOLTS (Connecting Rod)
Ferry Cap & Set Screw Co., 2151 Scranton Rd., Cleveland, O.

BOLTS (Heat Treated)
Bethlehem Steel Co., So. Bethlehem, Pa.

BOLTS (Swing and Shackle)
Ferry Cap & Screw Co., 2151 Scranton Rd., Cleveland, O.

BOLTS AND NUTS
American Bridge Co., New York City
Bayonne Bolt & Nut Co., Bayonne, N. J.
Rogers McCarthy & Rogers, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Camden Forge Co., Camden, N. J.
Clark Bros. Bolt Co., Milldale, Conn.
Ferry Cap & Screw Co., 2151 Scranton Rd., Cleveland, O.
Milton Mfg. Co., Milton, Pa.
National Bolt & Nut Co., Pittsburgh, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Peerless Nut Co., 4300 Perkins Ave., Cleveland, O.
Rockford Bolt Co., 220 Mill St., Rockford, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Chicago, Ill.

BORING MILLS
Gisholt Machine Co., Madison, Wis.
Lambert Machine & Engineering Co., Cleveland, O.
Milwaukee Electric Crane & Mfg. Co., Milwaukee.
New York Machinery Exchange, Inc. N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.

BORING AND TURNING MACHINES
Amalgamated Machinery Corp., 72 W. Adams St., Chicago
Baker Bros., Toledo, O.
Bapen-Lucas Machine Works, Front and Girard Ave., Philadelphia
Gisholt Machine Co., Madison, Wis.
Newton Machine Tool Works, Inc., 23rd and Vine St., Philadelphia
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.

BOX STRAPPING (Steel)
Acme Steel Goods Co., 2840 Archer Ave., Chicago

BOXES (Case-Hardening and Carbonizing)
Farrell-Cheek Steel Foundry Co., Sandusky, O.
Sivyer Steel Casting Co., Milwaukee, Wis.

BRAKES (Electric)
Cutler-Hammer Mfg. Co., The, Milwaukee
General Electric Co., Schenectady, N. Y.
Toledo Bridge & Crane Co., 2900 Dorr St., Toledo, O.

BRAKE SHOES
Pittsburgh Iron & Steel Foundries Co., Pgh.

BRASS AND COPPER (Perforated)
Erdle Perforating Co., Rochester, N. Y.

BRASS GOODS
Amalgamated Products Co., 165 Broadway, N. Y. C.
Lunkenheimer Co., The, Cincinnati, O.

BRAZING OUTFITS
Davis-Bournonville Co., Jersey City, N. J.
Linde Air Products Co., New York, N. Y.
Oxweld Acetylene Co., Chicago, Ill.

BRICK (Silica, Magnesia, Chrome)
American Refractories Co., 208 S. La Salle St., Chicago, Ill.
Orth, Frank, 3437 Fir St., Indiana Harbor, Ind.
Pyro Clay Products Co., The, Oak Hill, O.
Seisson, Jos., Fire Brick Co., Connellsville, Pa.
Stowe-Fuller Co., Cleveland, Ohio.
Union Mining Co., Mount Savage, Md.

BRICK INSULATING (See Insulating Brick)

BRICKMAKING MACHINERY
American Clay Machinery Co., Bucyrus, O.
Stevenson Co., The, Wellsville, O.

BRIDGES, BUILDINGS AND VIADUCTS (Steel)
Alliance Structural Co., Alliance, O.
American Bridge Co., New York, N. Y.
Bellefontaine Bridge & Steel Co., The, Bellefontaine, O.
Case Crane & Engineering Co., Columbus, O.
Lindsay, W. W., Co., Inc., 2 S. 15th St., Phila.
McClintic-Marshall Co., Pittsburgh, Pa.
McMyler Interstate Co., Cleveland, O.
Mt. Vernon Bridge Co., Mt. Vernon, O.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Riter-Conley Mfg. Co., Pittsburgh, Pa.

BRIQUETTING
General Briquetting Co., 25 Broad St., N. Y. C.

BRONZE
Keystone Bronze Co., Pittsburgh, Pa.

BRONZE (Manganese)
Bethlehem Steel Co., The, S. Bethlehem, Pa.

BRUSHES (Dynamo)
Dixon, Joseph, Crucible Co., Dept. 44-E, Jersey City, N. J.

BUCKETS (Clam Shell)
Hains, George, Mfg. Co., Inc. 145th St. and Rider Ave., New York
Hayward Co., The, 50-54 Church St., N. Y. C.
Lakewood Engrg. Co., Cleveland, O.
Williams, G. H., Co., Erie, Pa.

BUCKETS (Drag Line)
Hayward Co., The, 50-54 Church St., N. Y. C.

BUCKETS (Dumping)
Athe Car & Mfg. Co., Dept. R, Cleveland, O.

BUCKETS (For All Purposes)
Blaw-Knox Co., 602 Farmers Bank Bldg., Pgh.

BUCKETS (Grab)
American Bridge Co., New York, N. Y.
Brasse, Edgar E., Pittsburgh, Pa.
Brown Hoisting Machinery Co., Cleveland, O.
Case Crane & Engineering Co., Columbus, O.
Hains, George, Mfg. Co., Inc., 145th St. and Rider Ave., New York
Hayward Co., The, 50-54 Church St., N. Y. C.
Industrial Works, Bay City, Mich.
Link-Belt Co., Chicago, Ill.
McMyler Interstate Co., Cleveland, O.
Orton & Steinbrenner Co., 612 S. Dearborn St., Chicago
Pawling & Harnischfeger Co., Milwaukee, Wis.
Williams, G. H., Co., Erie, Pa.

BUCKETS (Skip)
Byers, John F., Machine Co., Ravenna, O.

BUGGIES (Wire)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BUILDERS (Community Homes)
Rodd Co., The, Century Bldg., Pittsburgh, Pa.

BULLDOZERS
Simmons Machine Co., Inc., Albany, N. Y.
United Engrs. & Fdy. Co., Pittsburgh, Pa.

BUNDLES—SCRAP, WIRE AND ROD
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BURNERS (Acetylene)
Davis-Bournonville Co., Jersey City, N. J.
Linde Air Products Co., New York, N. Y.
Oxweld Acetylene Co., Chicago, Ill.

BURNERS (Fuel Oil and Gas)
Gilbert & Barker Mfg. Co., Union St., Springfield, Mass.
Gwynn Engineering Co., Pittsburgh, Pa.

BUSINESS CARDS (Engraved)
Wiggins, John B., Co., 705 Peoples Gas Bldg., Chgo.

BY-PRODUCT COKE OVENS
Koppers Co., The, Pittsburgh, Pa.

CABINET SAND BLASTS
Pangborn Corporation, Hagerstown, Md.

CABLEWAYS AND TRAMWAYS
Macomber & Whyte Rope Co., Kenosha, Wis.

CABLE WIRE
Wright Wire Co., Worcester, Mass.

CARS (Dump)
Lakewood Engineering Co., Cleveland, O.

CARS (Industrial and Mining)
American Bridge Co., New York, N. Y.
American Steel Export Co., New York
Atlas Car & Mfg. Co., Dept. E, Cleveland, O.
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.
Chase Fdy. & Mfg. Co., Columbus, O.
Crawford & McClimmon Co., Brazil, Ind.
Koppel Industrial Car & Equipment Co., Koppel, Pa.
Lakewood Engrg. Co., Cleveland, O.
Lindsay, W. W., Co., Inc., 2 S. 15th St., Phila.
Shippers Car Line, New York, N. Y.
Treadwell Engineering Co., Easton, Pa.
Whiting Fdy. Equipment Co., Harvey, Ill.

CARS (Steel)
Cambria Steel Co., Philadelphia, Pa.

CASE HARDENING
Bidis, W. S., Co., 1411 E. 45th St., Cleveland, O.

CASE HARDENING BOXES
Ohio Steel Foundry Co., The, Springfield, O.
Sivyer Steel Casting Co., Milwaukee, Wis.

CASTINGS (Alloy Steel)
Bethlehem Steel Co., Bethlehem, Pa.

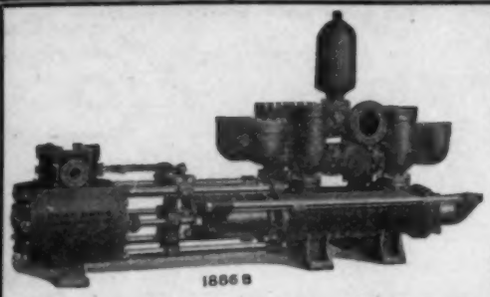
CASTINGS (Brass, Bronze and Aluminum)
Arcade Mfg. Co., Dept. C, Freeport, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Bromsbrasswyt Metals Co., Pittsburgh, Pa.
France Equipment Co., N. Baltimore, O.
Keystone Bronze Co., Pittsburgh, Pa.
McKinnon Iron Works Co., Ashtabula, Ohio.
Klots Machine Co., Sandusky, O.
Mackintosh, Hemphill & Co., Pittsburgh
Mitchell-Tappen Co., New York, N. Y.
Morgan Engineering Co., Alliance, O.
Ryder Brass Foundry Co., Bucyrus, O.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

CASTINGS (Die)
Lubricating Metal Co., 2 Rector St., New York City

CASTINGS (Electric Furnace)
Belle City Malleable Iron Co., Racine, Wis.
Latrobe Electric Steel Co., Latrobe, Pa.
Maynard Electric Steel Castings Co., Milwaukee, Wis.
Pelton Steel Co., Milwaukee, Wis.
Racine Steel Castings Co., Racine, Wis.
Sivyer Steel Casting Co., Milwaukee, Wis.
Standard Crucible Steel Castings Co., 13th and Lloyd Sts., Milwaukee, Wis.
Treadwell Engrg. Co., Easton, Pa.
United Alloys Steel Corp., The, Canton, O.

CASTINGS (Gear)
Allyne-Ryan Foundry Co., Cleveland, O.
Dayton Steel Foundry Co., Dayton, O.
Farrell-Cheek Steel Foundry Co., Sandusky, O.
Link-Belt Company, Chicago, Ill.
Ohio Steel Foundry Co., Springfield, O.
Penn Seaboard Steel Corp., Franklin Bk. Bldg., Phila.
Sivyer Steel Casting Co., Milwaukee, Wis.
Standard Steel Castings Co., Cleveland, O.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

CASTINGS (Gray Iron)
Adamson Machine Co., Akron, O.
Allegheny Foundry & Machine Co., Glassmere, Pa.
American Bridge Co., New York, N. Y.
Arcade Mfg. Co., Dept. C, Freeport, Ill.
Atlantic Foundry Co., 182 Beaver St., Akron, O.
Beckemeyer Foundry Co., Beckemeyer, Ill.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.
Bowler Foundry Co., 1692 Columbus Rd., Cleveland.
Cascade Foundry Co., Erie, Pa.
Centre Foundry & Machine Co., Wheeling, W. Va.
Challenge Machinery Co., Grand Haven, Mich.
City Foundry Co., Cleveland, O.
Cyclops Foundry Co., Pittsburgh, Pa.
Erie Foundry Co., Erie, Pa.
Excelsior Tool & Machine Co., E. St. Louis, Ill.
Farrar & Trefts, Buffalo, N. Y.
Farrel Foundry & Mach. Co., Ansonia, Conn.
Garden City Foundry Co., 3176 Archer Ave., Chicago, Ill.
Knott & Harker Co., Beaver Falls, Pa.
Klots Machine Co., Sandusky, O.
Link-Belt Company, Chicago, Ill.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Madison Fdy. Co., 927-945 Addison Rd., Cleveland.
Marshall Foundry Co., Pittsburgh, Pa.
McKinnon Iron Works Co., Ashtabula, Ohio.
Mesta Machine Co., Pittsburgh, Pa.
Michigan Machine Tool & Foundry Co., Ypsilanti, Mich.
Morgan Engineering Co., Alliance, O.
National Foundry Co., Erie, Pa.
Newark Stamping & Foundry Co., Newark, O.
North Buffalo Hdwe. Fdy. Co., Buffalo, N. Y.
Ohio Foundry Co., Cleveland, O.



18868

The valve movement of Dean Bros. **Durable Duplex Steam Pump** is the most important improvement that has been made on the Duplex Pump for twenty-five years. ***Send for Catalog 103.***

DEAN BROS. STEAM PUMP WORKS **INDIANAPOLIS**

NOT IN THE PUMP TRUST

ERIE CITY IRON WORKS
ERIE, PA., U.S.A.

Horizontal and Vertical Water Tube Boilers
Stationary Return Tubular Boilers
Economic Return Tubular Boilers
Steel Plate Construction
Write Us

BOILERS

Also

STACKS; TANKS; PLATE WORK; IRON CASTINGS.

We are Engineers and Machinists.
Let us put an end to your troubles.

Phoenix Iron Works Co.
Meadville, Pa.

Tower Permanence

Invest in a Caldwell Structural Tower and you have the permanence of a sky-scraper. It will serve you without depreciation and the need of costly repairs for a life-time.

The same latticed steel construction used in skyscrapers and bridges—the highest type of steel construction known—is used in this tower. It is designed by engineers and constructed according to engineering principles. It is the tower for those who realize the economy of a permanent investment.

Send for Catalogue.

W. E. CALDWELL CO., Inc.,
2350 Brook St.,
Louisville, Ky.

Caldwell TANKS AND TOWERS

DEMING
POWER PUMPS

Made for all pumping conditions. Capacities in standard sizes from 300 gallons to 130,000 gallons per hour. Special sizes built to order. Save from 40 to 60% over steam pumps. *Write for 192-page Catalogue.*

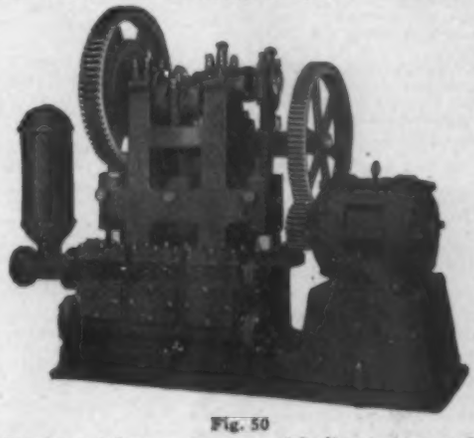


Fig. 50
Deming triplex power pump with direct connected electric motor.

The Deming Company - Salem, Ohio

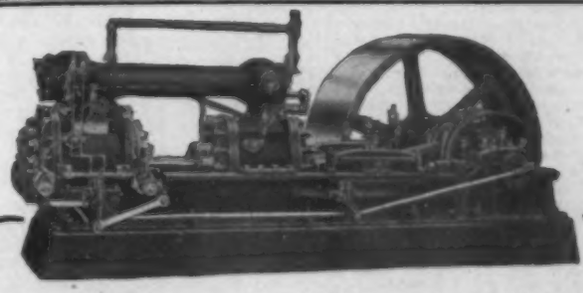
CHICAGO: Henion & Hubbell. PITTSBURGH: Harris Pump & Supply Co.
BUFFALO: Root, Neal & Co. NEW YORK: Ralph B. Carter Co.
BOSTON: Charles J. Jager & Co., 15 Custom House St.

Agencies in all principal cities.

Air-Tight Steel Tank Co.
PITTSBURGH, PA.

Tanks—High Pressure and Storage—Regular and Special to Order—Copper Brazed, Riveted or Welded—Gasoline Storage Tanks and Pumps—Structural and Machine Work.

Send us your inquiries or specifications.



Automatic Selective Proportional Unloaders are found exclusively on the NORWALK COMPRESSOR These improvements mark a new era in compressor construction. They gain the instant and favorable attention of all skilled engineers.

For the usual hackneyed claims of ECONOMY, DURABILITY and EFFICIENCY, let our forty years' experience be an assurance of adequate and discerning attention to every feature.

THE NORWALK IRON WORKS CO. South Norwalk, Conn.

CASTINGS (Gray Iron) (Continued)
Patch, E. R., Mfg. Co., Rutland, Vt.
Phoenix Iron Works Co., Meadville, Pa.
Producers Supply Co., Franklin, Pa.
Simpson Foundry Co., Newark, O.
Smith, T. L., Co., Milwaukee, Wis.
Standard Engrg. Co., Ellwood City, Pa.
Standard Foundry Co., Buffalo, N. Y.
St. Louis Malleable Casting Co., St. Louis, Mo.
Stevenson Co., The, Wellsville, O.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
U. S. Cast Iron Pipe & Foundry Co., 730 E. Pearl St., Burlington, N. J.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Williamson, J. E., Co., Bellwood, Pa.

CASTINGS (Malleable)
Abell-Howe Co., McCormick Bldg., Chicago.
Acme Steel & Malleable Iron Works, Inc., Buffalo, N. Y.
American Malleable Castings Co., Marion, O.
American Malleables Co., Lancaster, N. Y.
Belle City Malleable Iron Co., Racine, Wis.
Columbia Malleable Castings Co., Columbia, Pa.
Columbus Malleable Iron Co., Columbus, O.
Danville Malleable Iron Co., Danville, Ill.
Dayton Malleable Iron Co., Dayton, O.
Decatur Malleable Iron Co., Decatur, Ill.
Erie Malleable Iron Co., Erie, Pa.
Fanner Mfg. Co., Dept. T, Cleveland, O.
Fraser & Jones Co., Syracuse, N. Y.
Hammond Malleable Iron Co., Hammond, Ind.
Illinois Malleable Iron Co., Chicago, Ill.
Kalamazoo Malleable Iron Co., Kalamazoo, Mich.
Lakeside Malleable Castings Co., Racine, Wis.
Lancaster Foundry Co., Lancaster, Pa.
Link-Belt Company, Chicago, Ill.
Mal-Gra Castings Co., Cambridge City, Ind.
Marion Malleable Iron Works, Marion, Ind.
Missouri Malleable Iron Co., E. St. Louis, Ill.
Moline Malleable Iron Co., St. Charles, Ill.
Northwestern Malleable Iron Co., Milwaukee, Wis.
Peoria Malleable Castings Co., Peoria, Ill.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Richmond Malleable Castings Co., Richmond, Ind.
Ross-Meehan Foundries, Chattanooga, Tenn.
Standard Malleable Iron Co., Muskegon, Mich.
St. Louis Malleable Castings Co., St. Louis, Mo.
Vermillon Malleable Iron Co., Hoopeston, Ill.
Wisconsin Malleable Iron Co., Milwaukee, Wis.
Zanesville Malleable Iron Co., Zanesville, O.

CASTINGS (Semi-Steel)
Adamson Machine Co., Akron, O.
Allyne-Ryan Fdy. Co., Cleveland, O.
Beckemeyer Foundry Co., Beckemeyer, Ill.
Centre Foundry & Machine Co., Wheeling, W. Va.
City Foundry Co., Cleveland, O.
Cyclops Foundry Co., Pittsburgh, Pa.
Farrar & Trefts, Buffalo, N. Y.
Madison Fdy. Co., 927-945 Addison Rd., Cleveland.
Michigan Machine Tool & Foundry Co., Ypsilanti, Mich.
Morgan Engineering Co., Alliance, O.
Producers Supply Co., Franklin, Pa.
Smith, T. L., Co., Milwaukee, Wis.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

CASTINGS (Steel)
Adamson Machine Co., Akron, O.
Aetna Steel Castings Co., Cleveland, Ohio.
Allegheny Steel Co., Pittsburgh, Pa.
American Bridge Co., New York City
American Steel Foundries, Chicago, Ill.
Atlantic Foundry Co., 182 Beaver St., Akron, O.
Atlantic Steel Castings Co., Chester, Pa.
Atlas Steel Casting Co., Buffalo, N. Y.
Bayonne Steel Casting Co., Bayonne, N. J.
Belle City Malleable Iron Co., Racine, Wis.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Birdsboro Steel Fdy. & Machine Co., Birdsboro, Pa.
Burnside Steel Co., Chicago
Columbia Steel Co., San Francisco, Cal.
Connecticut Elec. Steel Co., Inc., Hartford, Conn.
Crucible Steel Casting Co., Cleveland, Ohio.
Dayton Steel Foundry, Dayton, O.
Fahnestock Mfg. Co., Avonmore, Pa.
Falk Company, Milwaukee, Wis.
Farrell-Cheek Steel Foundry Co., Sandusky, O.
Federal Steel Foundry Co., Chester, Pa.
Hubbard Steel Foundry Co., E. Chicago, Ind.
Kelly & Jones Co., Greensburg, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Michigan Steel Castings Co., Detroit, Mich.
Milwaukee Steel Fdy. Co., 101-121 S. Water St., Mil.
Morgan Engineering Co., Alliance, O.
National Foundry Co., Erie, Pa.
National Roll & Foundry Co., Avonmore, Pa.
National Steel Foundries, Milwaukee, Wis.
Ohio Steel Foundry Co., The, Springfield, O.
Otis Steel Co., Cleveland, O.
Penn Seaboard Steel Corp., Franklin Bk. Bldg., Phila.
Philadelphia Roll & Machine Co., Philadelphia, Pa.
Pittsburgh Iron & Steel Foundries Co., Pgh.
Pittsburgh Piping & Equipment Co., Pgh.
Racine Steel Castings Co., Racine, Wis.
Reading Steel Casting Co., Reading, Pa.
Reed Foundry & Machine Co., Kalamazoo, Mich.
Reliance Steel Casting Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Sharon Foundry Co., Sharon, Pa.
Steyer Steel Casting Co., Milwaukee, Wis.
Smith, Geo. H., Steel Casting Co., Milwaukee, Wis.
Standard Steel Castings Co., Cleveland, O.
St. Louis Steel Foundry Co., 1501 Kienlen Ave., St. Louis, Mo.
Strong Steel Fdy. Co., 33 Norris St., Buffalo, N. Y.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
West Steel Casting Co., Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.

CASTINGS (Stellite)
Haynes Stellite Co., The, Kokomo, Ind.

CASTINGS (White Metal)
Brenzbraswyt Metals Co., Pittsburgh, Pa.

CAUSTIC POTS
Farrar & Trefts, Buffalo, N. Y.

CEMENT (Furnace, High Temperature)
Botfield Specialties Co. Swanson & Clymer Sts. Phila.
Clinton Metallic Paint Co., Clinton, N. Y.
Quigley Furnace Specialties Co., 26 Cortlandt, N.Y.C.

CEMENT (Iron and Steel)
Shanafelt Mfg. Co., Canton, O.

CEMENT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Vulcan Iron Works, 1739 Main St., Wilkes-Barre, Pa.

CEMENT WATERPROOFING
Texas Co., Dept. T, 17 Battery Pl., New York City

CENTRAL STATION EQUIPMENT
Smith Gas Engrg. Co., The, Dayton, O.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

CENTRIFUGAL COAL DRIERS
Link-Belt Company, Chicago, Ill.

CHAIN BLOCKS
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

CHAIN DRIVES
Abell-Howe Co., McCormick Bldg., Chicago.
Link-Belt Company, Chicago, Ill.

CHAIN MACHINERY (Coil Chain)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

CHAINS
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Link-Belt Company, Chicago, Ill.

CHAINS (Conveyor)
Link-Belt Company, Chicago, Ill.

CHAINS (Power Transmitting)
Link-Belt Company, Chicago, Ill.

CHAIRS (Metal)
Royal Metal Mfg. Co., S. Western Ave., Chicago.

CHANNELS (See Steel Structural)

CHAPLETS
Champion Mch. & Forging Co., Cleveland, O.
Fanner Mfg. Co., Dept. T, Cleveland, O.
Lindsay, W. W., Co., Inc., 2 S. 15th St., Phila.
Shanafelt Mfg. Co., Canton, O.

CHARCOAL
Hillman, J. H., & Sons Co., Pittsburgh

CHECKS (Time, Tool and Pay)
Pannier Bros. Stamp Co., 207-209 Sandusky St, Pgh.

CHEMICALS
Ford, J. B., Co., Wyandotte, Mich.

CHEMISTS AND METALLURGISTS
Steel Improvement & Forge Co., Cleveland, O.
Wolstoncroft, I. C., 504 Marwood Ave., McKees Rocks, Pa.

CHROME ORE
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Lavino, E. J., & Co., Bullitt Bldg., Philadelphia.

CHUCKING MACHINES (Automatic)
Gisholt Machine Co., Madison, Wis.

CHUCKS
Jaeger, M., 342 Engineers Bldg., Cleveland, O.
Modern Tool Co., 3rd and French Sts., Erie, Pa.
Toomey, Frank, Inc., Philadelphia, Pa.

CHUCKS (Lathe)
Gisholt Machine Co., Madison, Wis.
Jaeger, M., 342 Engineers Bldg. Cleveland, O.
Whiten, D. E., Mach. Co., New London, Conn.

CHUCKS (Vertical Boring Mill)
Gisholt Machine Co., Madison, Wis.

CINDER MILLS (Water)
Whiting Foundry Equipment Co., Harvey, Ill.

CIRCUIT BREAKERS
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

CLAM SHELL BUCKETS
Lakewood Engineering Co., Cleveland, O.

CLAY MACHINERY
American Clay Machinery Co., Bucyrus, O.
Stevenson Co., The, Wellsville, O.

CLEANER (Metal)
Ford, J. B., Co., Wyandotte, Mich.

CLEANERS (Electric)
Wisconsin Electric Co., 3500 16th St., Racine, Wis.

CLEANING SPECIALTIES
Ford, J. B., Co., Wyandotte, Mich.

CLOCKS (Time)
Gisholt Machine Co., Madison, Wis.

CLUTCHES
Carlyle Johnson Mach. Co., Manchester, Conn.
Link-Belt Company, Chicago, Ill.

CLUTCHES (Couplings)
Carlyle Johnson Mach. Co., Manchester, Conn.

CLUTCHES (Friction)
Carlyle Johnson Mach. Co., Manchester, Conn.

CLUTCHES (Pulley)
Carlyle Johnson Mach. Co., Manchester, Conn.

COAL AND COKE
Addy, Matthew, Co., The, Cincinnati, O.
Baird & West, Detroit, Mich.
Bethlehem Steel Co., Bethlehem, Pa.
Crocker Bros., New York City
Hanna, M. A., & Co., Cleveland, O.
Hillman, J. H., & Sons Co., Pittsburgh.
McKeefrey & Co., Leetonia, O.
Mohr, J. J., & Son, Philadelphia, Pa.
Mudge, Edmund W., & Co., Pittsburgh.
Reilly-Peabody Fuel Co., Pittsburgh, Pa.
Rogers, Brown & Co., Cincinnati, O.
Semet-Solway Co., Syracuse, N. Y.
Snyder, W. P., Co., Pittsburgh, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.

COAL CRUSHERS AND PULVERIZERS
Bartlett & Snow, C. O., Co., Cleveland, O.
Fuller-Lehigh Co., Fullerton, Pa.
Link-Belt Company, Chicago, Ill.
Orton & Streinbrenner Co., 612 S. Dearborn St., Chicago
Raymond Bros. Impact Pulverizer Co., 1313 N. Branch St., Chicago

COAL, ORE AND ASH HANDLING MACHINERY
American Bridge Co., New York, N. Y.
Bartlett & Snow, C. O., Co., Cleveland, O.
Brown Hoisting Machinery Co., Cleveland, O.
Godfrey, John F., Elkhart, Ind.
Haiss, George, Mfg. Co., Inc., 145th St. and Rider Ave., New York
Hayward Co., The, 50-54 Church St., New York City
Link-Belt Company, Chicago, Ill.
Orton & Streinbrenner Co., 612 S. Dearborn St., Chicago

COAL TIPPLES
Link-Belt Company, Chicago, Ill.

COAL WASHERS
Link-Belt Company, Chicago, Ill.

COILS (Pipe)
Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa.
Power Piping Co., Pittsburgh, Pa.
Roessing-Ernst Co., Etna, Pittsburgh, Pa.

COKE OVEN MACHINERY
Wellman-Seaver-Morgan Co., Cleveland, O.

COKE OVENS (By-Product)
Koppers Co., The, Pittsburgh, Pa.

COMPRESSORS (Air)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Mackintosh, Hemphill & Co., Pittsburgh
Mesta Machine Co., Pittsburgh, Pa.
Norwalk Iron Works Co., So. Norwalk, Conn.
Wickes Brothers, Dept. A, Saginaw, Mich.

COMPRESSORS (Gas)
Norwalk Iron Works Co., So. Norwalk, Conn.

CONCENTRATE (Scheelite)
Minerva Tungsten Corp., 330 Investment Bldg., Los Angeles, Cal.

CONCRETE INSERTS
Dayton Malleable Iron Co., Dayton, O.

CONCRETE MIXERS
Lakewood Engrg. Co., Cleveland, O.
Smith, T. L., Co., Milwaukee, Wis.
Standard Scale & Supply Co., Pittsburgh, Pa.

CONDENSERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connersville Blower Co., The, Connersville, Ind.
Cooper, C. & G., Mt. Vernon, O.
Dean Bros. Steam Pump Works, Indianapolis, Ind.

CONDUCTORS (Armored Electric)
Youngstown Sheet & Tube Co., Youngstown, O.

CONDUITS (Electric)
Youngstown Sheet & Tube Co., Youngstown, O.

CONTRACTORS (See Engineers and Contractors)

CONTRACT WORK
Lincoln Engineering Co., Cleveland, O.

CONTROLLERS (Electric)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Morgan Engineering Co., Alliance, O.
Toledo Bridge & Crane Co., 2900 Dorr St., Toledo, O.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

CONVERTERS (Bessemer)
Pennsylvania Engineering Works, New Castle, Pa.

CONVERTERS (Steel Castings)
Whiting Foundry Equipment Co., Harvey, Ill.

CONVEYORS (Elevating and Conveying)
Bartlett & Snow, C. O., Co., Cleveland, O.
Godfrey, John F., Elkhart, Ind.
Haiss, George, Mfg. Co., Inc. 145th St. and Rider Ave., New York
Link-Belt Company, Chicago, Ill.
McMyler Interstate Co., Cleveland, O.
Roots, P. H., & F. M., Co., Connersville, Ind.
Vulcan Iron Wks., 1739 Main St., Wilkes-Barre, Pa.

COOLING BEDS
Treadwell Engineering Co., Easton, Pa.

COPPER
United Smelting & Al. Co., New Haven, Conn.

COPPER (Boronic All-Metal in Shot Form)
American Boron Products Co., Inc., 636 Court St., Reading, Pa.

COPPER ALUMINUM (Boronic All-Metal in Shot Form)
American Boron Products Co., Inc., 636 Court St., Reading, Pa

Special Machinery

Tools, Dies, Gauges,
Jigs and Fixtures

THE CUYAHOGA MACHINE & TOOL CO.

12416 Euclid Ave. Cleveland, O.

SHEAR BLADES
MACHINE KNIVES
FORGINGS

The Cleveland Knife & Forge Co.
Cleveland, Ohio

LAKESIDE FORGE CO. ERIE, PA.

DROP FORGED WRENCHES
ADJUSTABLE WRENCHES
SEND FOR CATALOG
DROP FORGINGS—LET US MAKE ESTIMATES

FAWCUS HERRINGBONE GEARS
Mill Drives . Turbine. Transmissions
Spur Gears . Bevel Gears . Worm Gearing
FAWCUS MACHINE COMPANY. PITTSBURGH, PA.

USE AUBURN BALL BEARINGS—Steel, Brass and Bronze Balls

State your problem or write for BULLETINS.
AUBURN BALL BEARING COMPANY, 30 Elizabeth Street, ROCHESTER, N. Y.

R. D. Wood & Co.

Guillotine Plate Shears, Forging Presses, Punches, Riveters and General Steel Working Tools. Accumulators, Pressure Pumps, Steam and Centrifugal Pumps, Gas Holders, Gas Power Plants with Producers. : : :

400 Chestnut St. Philadelphia, Pa.

SOLID TOOL STEEL
SHEAR KNIVES
AND
FORGINGS
(Miscellaneous Drop and Upset)
PITTSBURGH KNIFE & FORGE CO.
Office and Works: - - - PITTSBURGH, PA

Sand—ROLLS—Chilled
Roll Lathes—Shears—Special Machinery
Engineers—Founders—Machinists
The Youngstown Foundry & Machine Co., Youngstown, Ohio

R-S

Tapping Machines and Automatic Die Heads

We manufacture a complete line of high grade Tapping Machines and Automatic Adjustable Die Heads. Built to R-S standards.
Write for bulletins number 5 and 6.

RICKERT-SHAFER CO. ERIE, PA.
New York Office: 50 Church St.

Try a
Beach Automatic Grip Puller

Quick, strong, durable, efficient and simple.
Can be locked in any desired position.
Positive grip, cannot unhook, and adjusts to work instantly. Can be furnished with three long arms which open to 18", if desired.
Made also in small size as illustrated for magneto and other small work.
Write for Ten Day Trial Proposition.
The Greb Company, Inc.,
191 State St., Boston, Mass.

SPARTAN LEATHER BELTS
For Difficult Drives.
The Graton & Knight Mfg. Co. Worcester, Mass. U.S.A.

COPPER AND BRASS ROLLING MILL EQUIPMENT
Garrison, A., Foundry Co., Pittsburgh, Pa.

COPPER NICKEL (Boronic All-Metal in Shot Form)
American Boron Products Co., Inc., 636 Court St., Reading, Pa.

CORE MAKING MACHINES
Pridmore, Henry E., Chicago, Ill.

CORE OVENS
Whiting Fdy. Equipment Co., Harvey, Ill.

CORRUGATED FASTENERS
Acme Steel Goods Co., 2840 Archer Ave., Chicago

COVERINGS (Pipe and Boiler)
Armstrong Cork & Insulation Co., 101 24th St., Pgh.

COUNTING MACHINES
Hart, R. A., Mfg. Co., 79 Wilson Court, Battle Creek, Mich.

COUPLING BOXES
Pittsburgh Iron & Steel Foundries Co., Pittsburgh.

COUPLINGS
Connersville Blower Co., The, Connersville, Ind.
Mark Mfg. Co., 1907 Dempster St., Evanston, Ill.
Roots, P. H., & F. M., Co., Connersville, Ind.

COUPLINGS (Carriage)
Bradley, C. C., & Son, Inc., Syracuse, N. Y.

CRANES
Abell-Howe Co., McCormick Bldg., Chicago.
National Products Co., East Liverpool, O.
New York Machinery Exchange, Inc., N. Y. C.

CRANES (Charging)
Alliance Machine Co., Alliance, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Pawling & Harnischfeger Co., Milwaukee, Wis.

CRANES (Electric)
Case Crane & Engrg. Co., The, Columbus, O.
Link-Belt Company, Chicago, Ill.
Mitchell-Tappen Co., New York, N. Y.
Morgan Engineering Co., Alliance, O.
Whiting Fdy. Equipment Co., Harvey, Ill.

CRANES (Electric Traveling)
Alliance Machine Co., Alliance, O.
Chesapeake Iron Works, Baltimore, Md.
Cleveland Crane & Engineering Co., Wickliffe, O.
Euclid Crane & Hoist Co., Dept. B, Euclid, O.
Lakeside Bridge & Steel Co., 123 Villard Ave., N. Milwaukee, Wis.
Milwaukee Elec. Crane & Mfg. Co., Milwaukee.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Payne, N. B., New York, N. Y.
Pgh. Crane & Equip. Co, 907 Phipps Power Bldg, Pgh.
Schoenmaker, A. G., & Sons, New York, N. Y.
Shaw Electric Crane Co., New York, N. Y.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., 2900 Dorr St., Toledo, O.

CRANES (Hand)
Case Crane & Engrg. Co., The, Columbus, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Lakeside Bridge & Steel Co., 123 Villard Ave., N. Milwaukee, Wis.
Link-Belt Company, Chicago, Ill.
Milwaukee Elec. Crane & Mfg. Co., Milwaukee.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Toledo Bridge & Crane Co., 2900 Dorr St., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES (Hydraulic)
Alliance Machine Co., Alliance, O.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Morgan Engineering Co., Alliance, O.
Ridgway, Craig, & Son, Coatesville, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

CRANES (Jib)
Case Crane & Engineering Co., Columbus, O.
Lakeside Bridge & Steel Co., 123 Villard Ave., N. Milwaukee, Wis.

CRANES (Locomotive)
Brown Hoisting Machinery Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Industrial Works, Bay City, Mich.
Link-Belt Company, Chicago, Ill.
McMyler Interstate Co., Cleveland, O.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Orton & Steinbrenner Co., 612 S. Dearborn St., Chicago
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shaw Electric Crane Co., New York, N. Y.

CRANES (Pillar)
Lakeside Bridge & Steel Co., 123 Villard Ave., N. Milwaukee, Wis.

CRANES (Steam Cleaning House)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

CRANES (Steam and Pneumatic, Wire Mills)
Cleveland Crane & Engrg. Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

CRANK SHAFTS
Bay City Forge Co., Erie, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Camden Forge Co., Camden, N. J.
Leard, The Wm., Co., New Brighton, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.

CROSS ARMS (Creosoted)
Jennison-Wright Co., 2485 Broadway, Toledo, O.
Republic Creosoting Co., Indianapolis, Ind.

CRUCIBLES
Dixon, Joseph, Crucible Co., Dept. 64-B, Jersey City, N. J.

CRUSHER JAWS AND ROLLS
Pittsburgh Iron & Steel Foundries Co., Pittsburgh.

CRUSHING, GRINDING & PULVERIZING MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Clay Machinery Co., Bucyrus, Ohio.
Bonnot Co., The, Canton, Ohio.
Fuller-Lehigh Co., Fullerton, Pa.
Phillips & MacLaren Co., Pittsburgh, Pa.
Raymond Bros. Impact Pulverizer Co., 1313 S. Branch St., Chicago, Ill.
Stevenson Co., The, Wellsville, Ohio.
Vulcan Iron Wks., 1739 Main St., Wilkes Barre, Pa.

CUPOLA BLOCKS
Freeman Fire Brick Co., Steubenville, O.
Hydraulic-Press Brick Co., Fire Brick Dept., St. Louis, Mo.
Mutton Hollow Fire Brick Co., The, Woodbridge, N. J.

CUPOLA, FURNACE AND FORGE LININGS. See Linings (Cupola, Furnace and Forge)

CUPOLAS
Whiting Fdy. Equipment Co., Harvey, Ill.

CUPRO-VANADIUM
American Vanadium Co., Pittsburgh, Pa.

CUT-OFF COUPLINGS
Carlyle Johnson Mach. Co., Manchester, Conn.

CUTTERS (Keyway)
Morton Mfg. Co., Muskegon Heights, Mich.

CUTTERS (Milling)
Becker Milling Machine Co., Boston, Mass.
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.
Cleveland Power Transmission Co., Cleveland, O.
Detroit Reamer & Tool Co., Detroit, Mich.
Jaeger, M., 342 Engineers Bldg., Cleveland, O.
National Tool Co., Cleveland, Ohio.

CUTTERS (Pipe)
Hunter Saw & Machine Co., Pittsburgh.
Pgh. Saw & Mfg. Co., 32nd & Smallman Sts., Pgh.

CUTTERS (Stellite)
Haynes Stellite Co., The, Kokomo, Ind.

CUTTERS LINK (Coil Chain)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

CUTTING AND WELDING (Oxy-Acetylene Process)
Davis-Bournonville Co., Jersey City, N. J.
Linde Air Products Co., New York
Oxweld Acetylene Co., Chicago, Ill.

CUTTING AND WELDING APPARATUS (Electric)
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

CUTTING OFF MACHINES
Cleveland Punch & Shear Works Co., Cleveland, O.
Espen-Lucas Machine Wks., Front and Girard, Phila.
Newton Mach. Tool Wks., Inc., 23rd & Vine, Phila.
New York Machinery Exchange, Inc., N. Y. C.
Peerless Machine Co., 1605 Racine St., Racine, Wis.
Racine Tool & Machine Co., Racine, Wis.
Toomey, Frank, Inc., Philadelphia, Pa.

CYANIDE POTS
Sivyer Steel Casting Co., Milwaukee, Wis.

CYLINDERS (Pressure)
Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa.
National Tube Co., Pittsburgh, Pa.

DELIVERY TRUCKS
Federal Motor Truck Co., Detroit, Mich.

DEOXIDIZERS (Boronic All-Metal in Shot Form)
American Boron Products Co., Inc., 636 Court St., Reading, Pa.

DERRICKS AND FITTINGS
American Bridge Co., New York, N. Y.
Case Crane & Engineering Co., Columbus, O.
Hayward Co., The, 50-54 Church St., New York City
Williams, G. H., Co., Erie, Pa.

DERRICKS (Steel)
Lakeside Bridge & Steel Co., 123 Villard Ave., N. Milwaukee, Wis.

DIE BLOCKS
Bethlehem Steel Co., Bethlehem, Pa.
Farrell-Cheek Steel Foundry Co., Sandusky, O.
Hammond Steel Co., Inc., Syracuse, N. Y.
Heppenstall Forge & Knife Co., Pittsburgh, Pa.

DIE BLOCKS (Pressed and Hammered)
Bethlehem Steel Co., Bethlehem, Pa.
General Steel Co., Milwaukee, Wis.

DIE CASTING
Sons Mfg. Co., Brooklyn, N. Y.

DIE HEADS
Jaeger, M., 342 Engineers Bldg., Cleveland, O.

DIE HEADS (Automatic)
Rickert-Shafer Co., 612 W. 12th St., Erie, Pa.

DIE MAKING MACHINES
Anderson Die Machine Co., Bridgeport, Conn.

DIES
American Vanadium Co., The, Pittsburgh, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Crosman Stamping Co., Ypsilanti, Mich.
Jaeger, M., 342 Engineers Bldg., Cleveland, O.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Lansing Stamping & Tool Co., Lansing, Mich.
Modern Tool Co., 3rd and French Sts., Erie, Pa.
Pittsburgh Iron & Steel Foundries Co., Pittsburgh.
Sivyer Steel Casting Co., Milwaukee, Wis.
Standard Tool & Mfg. Co., 70 Lafayette Blvd. E., Detroit, Mich.
Toledo Machine & Tool Co., Toledo, O.

DIES (For Special Shapes)
Empire Art Metal Co., College Pt., N. Y.

DIES (Lettering and Embossing)
Pannier Bros. Stamp Co., 207-209 Sandusky St., Pittsburgh

DIGGING AND EXCAVATING MACHINERY
Haiss, George, Mfg. Co., Inc., 145th St. and Rider Ave., New York
Hayward Co., The, 50-54 Church St., N. Y. C.
Williams, G. H., Co., Erie, Pa.

DOLOMITE (Dead Burned)
Davison, Allen S., Co., Pittsburgh, Pa.

DOORS (Hollow Steel)
Empire Art Metal Co., College Pt., N. Y.

DOORS AND SHUTTERS (Steel Rolling)
Edwards Mfg. Co., 401-451 Culvert St., Cincinnati

DOWELS (Brass and Wood)
Shanafelt Mfg. Co., Canton, O.

DRAWING TABLES
Economy Drawing Table Co., Toledo, O.
Hein Furniture Co., 126-136 S. Huron St., Toledo, O.

DRILLING MACHINERY
Baker Bros., Toledo, O.
Cleveland Pneumatic Tool Co., Cleveland, O.
Gisholt Machines Co., Madison, Wis.
Milwaukee Electric Crane & Mfg. Co., Milwaukee.
National Machinery Co., The, Tiffin, O.
Newton Machine Tool Works, Inc., 23rd and Vine Sts., Philadelphia
New York Machinery Exchange, Inc., N. Y. C.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.

DRILLS
Cleveland Power Transmission Co., Cleveland, O.
Detroit Reamer & Tool Co., Detroit, Mich.
Latrobe Tool Co., The, Latrobe, Pa.
Newton Machine Tool Wks., Inc., 23rd & Vine, Phila.
Wickes Brothers, Dept. A, Saginaw, Mich.
Wisconsin Electric Co., 3500 10th St., Racine, Wis.

DRILLS (Rock)
Wickes Brothers, Dept. A, Saginaw, Mich.

DRILLS (Twist)
Boker, H., & Co., 101 Duane St., N. Y. C.
Cleveland Power Transmission Co., Cleveland, O.
Detroit Reamer & Tool Co., Detroit, Mich.
Jaeger, M., 342 Engineers Bldg., Cleveland, O.

DRYERS (Ore)
Fuller-Lehigh Co., Fullerton, Pa.

DRYERS (Sand, Coal, Ores, Chemicals, etc.)
Bartlett & Snow, C. O., Co., Cleveland, O.

DUST EXHAUSTER (Arrester System)
Pangborn Corporation, Hagerstown, Md.
Whiting Foundry Equipment Co., Harvey, Ill.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

ELECTRICAL EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Duquesne Electric & Mfg. Co., Pittsburgh, Pa.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.

ELECTRIC LIGHT EQUIPMENT
Smith Gas Engrg. Co., The, Dayton, O.

ELECTRIC LOCOMOTIVES AND TRACTORS
Lakewood Engineering Co., Cleveland, O.

ELECTRIC MACHINERY (Second Hand)
Dotterweich, A. J., Co., Inc., Buffalo, N. Y.
Nathan Klein & Co., Inc., New York City
Potts, Henry, & Co., Philadelphia, Pa.
Power Equipment Co., Philadelphia, Pa.

ELECTROLYTIC CELLS
Electrolytic Oxy-Hydrogen Laboratories, Inc., New York City

ELECTROLYTIC OXYGEN AND HYDROGEN GENERATORS
Electrolytic Oxy-Hydrogen Laboratories, Inc. New York City

ELEVATORS
Ridgway, Craig & Son, Coatesville, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

ELEVATORS (Bucket)
Bartlett & Snow, C. O., Co., Cleveland, O.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Company, Chicago, Ill.
Stevenson Co., The, Wellsville, O.

ELEVATORS (Concrete)
Smith, T. L., Co., Milwaukee, Wis.

ELEVATORS (Hydraulic)
Ridgway, Craig, & Son, Coatesville, Pa.

ELEVATORS (Portable)
N. Y. Revolving Portable Elevator Co., 391 Garfield Ave., Jersey City, N. J.
Revolvator Co., 391 Garfield Ave., Jersey City, N. J.

ENGINE LATHES—See LATHES (Engine)

ENGINEERS AND CONTRACTORS
Abramsen Engineering Co., Pittsburgh, Pa.
American Bridge Co., New York City.
Case Crane & Engrg. Co., The, Columbus, O.
Chase, Frank D., Chicago, Ill.
Chesapeake Iron Works, Baltimore, Md.
Garrison, A., Foundry Co., Bingham St., Pgh.
Freyn, Brassert & Co., Peoples Gas Bldg., Chicago.
Kratzer, W. N., Co., 3212 Smallman St., Pittsburgh
Laughlin, Alex, & Co., Pittsburgh, Pa.

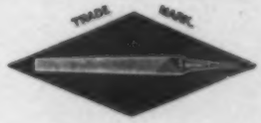
OLDHAM CHIPPING HAMMERS and FOUNDRY RAMMERS

Made in several sizes, suitable for all classes of work.

Used by many of the principal steel mills and foundries.

GEO. OLDHAM & SON COMPANY
FRANKFORD, PHILADELPHIA, PA.

Black Diamond File Works



Twelve Medals Awarded for "Very Superior Goods" at International Exhibitions

Special Prize GOLD MEDAL at Atlanta, Ga., 1895

G. & H. Barnett Co. Philadelphia PA.
Owned and Operated by Nicholson File Co.

OXYHYDROGEN
QUINTESSENCE OF PURITY
INTERNATIONAL OXYGEN COMPANY
115 BROADWAY NEW YORK

Bowes
AIR HOSE COUPLINGS and CLECO NEVER-SLIP HOSE CLAMPS
Write for Bulletin No. 39

Saves Air Time and Money

Tight Under all Pressures

OVER 1,500,000 IN GENERAL USE
Manufactured by
THE CLEVELAND PNEUMATIC TOOL CO., Cleveland, O.

The Kilby Manufacturing Company
CLEVELAND, OHIO
Foundry, Machine and Boiler Shop
Sugar Machinery—Wire and Nail Machinery
Blast Furnace and Rolling Mill Work
Estimates given on all classes of machinery

THE CANTON PATTERN & MFG. CO.
CANTON, OHIO Established 1907

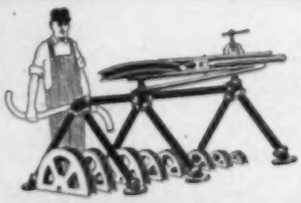
A pattern plant especially equipped to handle unusual large work.

We specialize on patterns too large for other manufacturers.

Let us astonish you with our prices and delivery.

Mail us your prints for quotation.

The above pattern is for 8" Caterpillar Gun Mount 28 x 12 ft.



WONDER 10 Models Pipe, Tubing and Solid Bar Benders

Bend all sizes of standard or double thick steel, wrought iron, brass and copper pipe from ⅛" to 6"; tubing from ⅛" to 7"; round, square and twisted solid stock from ⅛" to 3".

American Pipe Bending Machine Co.
Manufacturers
93 Pearl St. Boston, Mass., U. S. A.

STOVE TRIMMINGS

Malleable Iron Castings
Foundry Chaplets
Tumbling Stars

Mark Inquiries Dept. T. We Solicit your Business.

THE FANNER MFG. CO. CLEVELAND, O.

BOX STRAPPING
ACME STEEL GOODS COMPANY
CHICAGO - NEW YORK - ATLANTA - SAN FRANCISCO

BOLT, NUT, FORGING and WIRE NAIL MACHINERY

"National" Wedge Grip Bolt and Rivet Headers, National Bolt Cutters, National Heavy-Pattern Forging Machines, Etc.

We solicit your inquiries

THE NATIONAL MACHINERY COMPANY
TIFFIN, OHIO, U. S. A.

The heart of all
AMERICAN-WADSWORTH PRESSURE SAND BLAST APPARATUS
is a patented Automatic Filling Valve that eliminates elevating buckets, chains, overhead hoppers. No sand valves to wear. 30% to 50% higher efficiency than any suction system. Less than half the mechanism of any other pressure system.

THE SAND MIXING MACHINE CO. 52 VANDER BILT AVE. NEW YORK

PORTAGE SANDS
Quality and Service
THE PORTAGE SILICA CO
Youngstown Ohio

ENGINEERS AND CONTRACTORS—Continued
McClintic-Marshall Co., Pittsburgh, Pa.
McClure, Geo. W., Sons & Co., Pittsburgh, Pa.
McKee, Arthur G., & Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Rodd Co., The, Century Bldg., Pittsburgh, Pa.
Smythe, S. R., The, Co., Pittsburgh, Pa.
Swindell, Wm., & Bros., Pittsburgh, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

ENGINEERS (Consulting)
Chase, Frank D., Chicago, Ill.
Duff, Samuel E., Pittsburgh, Pa.
Ellis, Frank L., Pittsburgh, Pa.
Freyn, Brassert & Co., Peoples Gas Bldg., Chicago.
Kennedy, Julian, Pittsburgh, Pa.
Moore, W. E., & Co., Pittsburgh, Pa.
Shover, Barton R., Pittsburgh, Pa.

ENGINEERS (Foundry, Mechanical and Electrical)
Chase, Frank D., 122 S. Michigan Ave., Chicago, Ill.
Standard Sand & Mach. Co., Cleveland, O.

ENGINEERS (Industrial)
Chase, Frank D., 122 S. Michigan Ave., Chicago, Ill.

ENGINES (Blowing)
Mesta Machine Co., Pittsburgh, Pa.

ENGINES (Gas, Gasoline and Oil)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Cooper, C. & G., Co., Mt. Vernon, O.
Mesta Machine Co., Pittsburgh, Pa.
Producers Supply Co., Franklin, Pa.
Standard Scale & Supply Co.,
1631 Liberty St., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

ENGINES (Hoisting and Hauling)
Crawford & McCrimmon Co., Brazil, Ind.
Vulcan Iron Wks., 1739 Main St., Wilkes-Barre, Pa.

ENGINES (Marine)
Carlyle Johnson Mach. Co., Manchester, Conn.

ENGINES (Steam)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Cooper, C. & G., Co., Mt. Vernon, O.
Dake Engine Co., Grand Haven, Mich.
Erie City Iron Works, Erie, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Toomey, Frank, Inc., Philadelphia, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Vulcan Iron Wks., 1739 Main St., Wilkes-Barre, Pa.

ENGRAVERS (Steel and Copper Plate)
Wiggins, John B., Co., 705 Peoples Gas Bldg., Chgo.

EXHAUSTERS (Gas)
Connersville Blower Co., The, Connersville, Ind.
Roots, P. H., & F. M., Co., Connersville, Ind.

EXPORTERS
American Steel Export Co., New York City.
Federal Export Corp., 42 Broadway, New York City.
Ferro Supply Corp., Inc., 41 Union Sq., N. Y. C.
Liberty Steel Products Co., New York City
Vulcan Steel Products Co., New York City

EYEBARS
American Bridge Co., New York City

EYE PROTECTORS
Standard Optical Co., Geneva, N. Y.

FACINGS (Foundry)
Dixon, Joseph, Crucible Co.,
Dept. 64-B, Jersey City, N. J.

FANS (Ventilating)
Buckeye Blower Co., Columbus, O.

FENCES (See Wire Fences)

FERRO-ALLOYS
Canada Carbide Sales Co., 30 Church St., N. Y. C.
Davison, Allen S., Co., Pittsburgh, Pa.
Fairbanks, Morse & Co., New York City
Keokuk Electro-Metals Co., 1518 Corn Exchange
Bank Bldg., Chicago, Ill.
Southern Ferro Alloys Co., Chattanooga, Tenn.
United States Alloys Corp., 28 E. 42nd St., N. Y. C.

FERRO-CARBON TITANIUM
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

FERRO-CHROME
Lavino, E. J., & Co., Bullitt Bldg., Philadelphia.

FERRO-MANGANESE
Bethlehem Steel Co., Bethlehem, Pa.
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Crocker Bros., New York City
Lavino, E. J., & Co., Bullitt Bldg., Philadelphia.
Marshall, Edward E., Bullitt Bldg., Philadelphia.
Mohr, J. J., & Sons, Philadelphia, Pa.
Rogers, Brown & Co., Cincinnati, O.
Samuel, Frank, Harrison Bldg., Philadelphia, Pa.

FERRO-MOLYBDENUM
Lavino, E. J., & Co., Bullitt Bldg., Philadelphia.

FERRO-SILICON
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Canada Carbide Sales Co., 30 Church St., N. Y. C.
Crocker Bros., New York City
Davison, Allen S., Co., Pittsburgh, Pa.
Eaton, Rhodes & Co., Cincinnati, O.
Globe Iron Co., Jackson, O.
Keokuk Electro-Metals Co., 1518 Corn Exchange
Bank Bldg., Chicago, Ill.
Lavino, E. J., & Co., Bullitt Bldg., Philadelphia.
Mohr, J. J., & Sons, Philadelphia, Pa.
Niagara Electric Furnace Co., Inc.,
Niagara Falls, N. Y.
Rogers, Brown & Co., Cincinnati, O.
Samuel, Frank, Harrison Bldg., Philadelphia, Pa.
Southern Ferro Alloys Co., Chattanooga, Tenn.
United States Alloys Corp., 28 E. 42d St., N. Y. C.

FERRO-TUNGSTEN
Fairbanks, Morse & Co., New York City
Lavino, E. J., & Co., Bullitt Bldg., Philadelphia.
Vanadium Alloys Steel Co., Pittsburgh, Pa.

FERRO-VANADIUM
American Vanadium Co., Pittsburgh, Pa.

FILES
Disston, Henry & Sons, Inc., Philadelphia, Pa.
Nicholson File Co., Providence, R. I.
Searle Manufacturing Co., Anderson, Ind.

FILLET (Leather and Wood)
Barnett, G. & H., Co., Philadelphia, Pa.
Shanafelt Mfg. Co., Canton, O.

FIRE BRICK AND CLAY
American Fire Clay & Products Co., Cleveland, O.
Ashland Fire Brick Co., Ashland, Ky.
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Brighton Fire Brick Co., New Brighton, Pa.
Clearfield Fire Brick Co., Clearfield, Pa.
Denver Fire Clay Co.,
1742 Champa St., Denver, Col.
Dover Fire Brick Co., Cuyahoga Bldg., Cleveland, O.
Freeman Fire Brick Co., Steubenville, O.
Green, A. P., Fire Brick Co., Mexico, Mo.
Harbison-Walker Refractories Co., Pittsburgh, Pa.
Hydraulic-Press Brick Co.,
Fire Brick Dept., St. Louis, Mo.
Kier Fire Brick Co., Pittsburgh, Pa.
Louisville Fire Brick Co., Highland Park, Ky.
McLain Fire Brick Co., Pittsburgh, Pa.
Mutton Hollow Fire Brick Co., The,
Woodbridge, N. J.
Pope, Frank B., Co., Pittsburgh, Pa.
Portsmouth Refractories Co., Portsmouth, O.
Pyro Clay Products Co., The, Oak Hill, O.
Queen's Run Fire Brick Co., Lock Haven, Pa.
Sharon Fire Brick Co., Sharon, Pa.
Stowe-Fuller Co., Cleveland, Ohio.
Union Mining Co., Mt. Savage, Md.
West Virginia Fire Clay Mfg. Co.,
Diamond Bank Bldg., Pittsburgh, Pa.

FIRE BRICK CEMENT
Botfield Specialties Co.,
Swanson and Clymer Sts., Philadelphia, Pa.
Clinton Metallic Paint Co., Clinton, N. Y.
Quigley Furnace Specialties Co., 26 Cortlandt, N.Y.C.

FIRE DOORS AND SHUTTERS
Merchant & Evans Co., Philadelphia, Pa.

FIREPROOF CLOTHING
Holcomb Safety Garment Co.,
14 S. Jefferson St., Chicago, Ill.

FLANGING PRESSES
Southwark Foundry & Machine Co., Philadelphia.

FLANGES (Pipe)
Dart, E. M., Mfg. Co., Providence, R. I.
Power Piping Co., Pittsburgh, Pa.

FLASK LUMBER
Johnson, Thomas V., Inc.,
1532 First National Bank Bldg., Milwaukee.

FLASKS (Foundry)
Newark Stamping & Foundry Co., Newark, O.

FLOORING (Creosoted Wood Block)
Jennison-Wright Co., 3485 Broadway, Toledo, O.
Pgh. Wood Preserving Co., Century Bldg., Pgh.
Republic Creosoting Co., Indianapolis, Ind.
Rodd Co., The, Century Bldg., Pittsburgh, Pa.

FLUE WELDERS
Southwark Foundry & Mach. Co., Philadelphia, Pa.

FLUOR-SPAR
Lavino, E. J., & Co., Bullitt Bldg., Philadelphia.
Rogers, Brown & Co., Cincinnati, O.

FLUXES (Boronic All-Metal in Shot Form)
American Boron Products Co., Inc.,
636 Court St., Reading, Pa.

FLY WHEELS
Mesta Machine Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

FORGES
Bradley, C. C., & Son, Inc., Syracuse, N. Y.

FORGES (Rivet Heating)
Mahr Mfg. Co., 715 15th Ave., N. E.,
Minneapolis, Minn.

FORGING BARS (Alloy Steel)
General Steel Co., Milwaukee, Wis.

FORGING BILLETS (Alloy and Carbon Steel)
General Steel Co., Milwaukee, Wis.
Tennessee Coal, Iron & R. R. Co.,
Birmingham, Ala.

FORGING INGOTS (Alloy and Carbon Steel)
General Steel Co., Milwaukee, Wis.

FORGING MACHINERY
Bliss, E. W., Co., 8 Adams St., Brooklyn
Erie Foundry Co., The, Erie, Pa.
Garrison, A., Foundry Co., Bingham St., Pgh.
Morgan Engineering Co., Alliance, O.
Simmons Machine Co., Inc., Albany, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

FORGINGS (Drop)
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Champion Mch. & Forging Co., Cleveland, O.
Cleveland Hardware Co., Cleveland, O.
Columbus Forge & Iron Co., Columbus, O.
Drop Forging Co. of New York, Jersey City, N. J.
Eccles, Richard, Co., Auburn, N. Y.
General Drop Forge Co., Buffalo, N. Y.
Ingalls-Shepard Forging Co., Chicago, Ill.
Lakeside Forge Co., Erie, Pa.
Pittsburgh Knife & Forge Co., Pittsburgh, Pa.
Rockford Drop Forge Co., Rockford, Ill.
Scranton Forging Co., Scranton, Pa.
Steel Car Forge Co., Pittsburgh, Pa.
Steel Improvement & Forge Co., Cleveland, O.
Tioga Steel & Iron Co., Philadelphia, Pa.
Wilcox, D., Mfg. Co., Mechanicsburg, Pa.
Williams, J. H., & Co.,
58 Richards St., Brooklyn, N. Y.

FORGINGS (Ingot)
Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Andrews Steel Co., Newport, Ky.
Bethlehem Steel Co., S. Bethlehem, Pa.
Camden Forge Co., Camden, N. J.
Crowley, John A., Detroit, Mich.
Illinois Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Nagle Steel Co., Pottstown, Pa.
Penn Seab'd Steel Corp., Franklin Bank Bldg., Phila.
Tennessee Coal, Iron & R. R. Co.,
Birmingham, Ala.
Tioga Steel & Iron Co., Philadelphia, Pa.
United Alloys Steel Corp., Canton, O.
Wickwire Steel Co., Buffalo, N. Y.

FORGINGS (Iron and Steel)
Akron-Selle Co., Akron, Ohio.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Amalgamated Products Co., 165 Broadway, N. Y. C.
American Bridge Co., New York City
American Steel Export Co., New York City
American Vanadium Co., The, Pittsburgh, Pa.
Bay City Forge Co., Erie, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bradley, C. C., & Son, Inc., Syracuse, N. Y.
Camden Forge Co., Camden, N. J.
Champion Mch. & Forging Co., Cleveland, O.
Cleveland Hardware Co., Cleveland, O.
Cleveland Knife & Forge Co., Cleveland, O.
Columbus Forge & Iron Co., Columbus, O.
Cruse-Crawford Manufacturing Co., Birmingham, Ala.
Drop Forging Co., of N. Y., Jersey City, N. J.
Hammond Steel Co., Inc., Syracuse, N. Y.
Heppenstall Forge & Knife Co., Pittsburgh, Pa.
Jersey Forging Works,
16th St. and Jersey Ave., Jersey City, N. J.
Joliet Forge Co., Joliet, Ill.
Midvale Steel & Ordnance Co., Philadelphia, Pa.
Morgan Engineering Co., Alliance, O.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.
Steel Car Forge Co., Pittsburgh, Pa.
Steel Improvement & Forge Co., Cleveland, O.
Tioga Steel & Iron Co., Philadelphia, Pa.
Wilcox, D., Mfg. Co., Mechanicsburg, Pa.

FORMS (Concrete Construction)
Blaw-Knox Co., 602 Farmers Bank Bldg., Pgh.

FOUNDRY EQUIPMENT AND SUPPLIES
Arcade Mfg. Co., Dept. C, Freeport, Ill.
National Engineering Co., Machinery Hall Bldg.,
549 W. Wasington St., Chicago, Ill.
Oldham, Geo., & Sons Co., Frankford, Philadelphia.
Pridmore, Henry E., Chicago, Ill.
Shanafelt Mfg. Co., Canton, O.
Standard Sand & Machine Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

FOUNDRY GLOVES
Hickory Steel-Grip Glove Co.,
Box No. R. 6, Chicago, Ill.

FOUNDRY PLANTS
Whiting Foundry Equipment Co., Harvey, Ill.

FRAMES (Wire Drawing)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

FROGS (Railroad and Trolley)
Bethlehem Steel Co., The, So. Bethlehem, Pa.

FUEL OIL
Clarendon Refining Co., Oliver Bldg., Pittsburgh.
Paragon Refining Co., Toledo, O.
Sloan & Zook, Bradford, Pa.
Texas Co., Dept. T, 7 Battery Pl., New York
Warren Oil Co. of Pennsylvania, Warren, Pa.

FURNACE INSULATION
Celite Products Co., 11 Broadway, New York

FURNACES (Annealing and Case Hardening)
American Shop Equipment Co., Chicago, Ill.
Dempsey, H. B., Furnace Co.,
253 Broadway, N. Y. C.
General Electric Co., Schenectady, N. Y.
Gilbert & Barker Mfg. Co.,
Union St., Springfield, Mass.
Hagan, Geo. J., Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Rockwell, W. S., Co., 50 Church St., N. Y. C.
Swindell, Wm., & Bros., Pittsburgh, Pa.
Whiting Fdy. Equipment Co., Harvey, Ill.

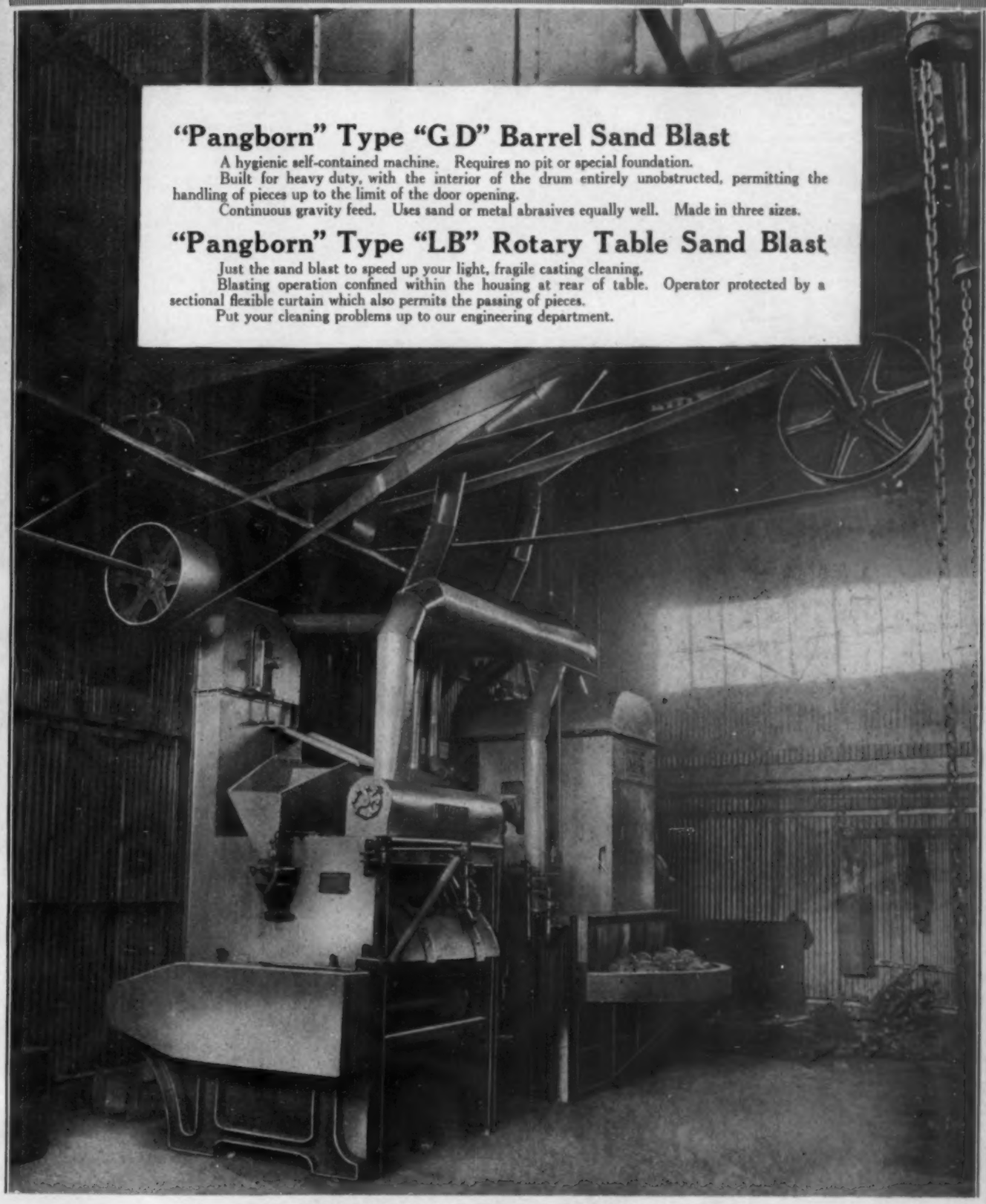
FURNACES (Blast)
Hagan, Geo. J., Co., Pittsburgh, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
McKee, Arthur G., & Co., Cleveland, O.
Pennsylvania Engrg. Works, New Castle, Pa.
Smythe, S. R., Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

FURNACES (Crucible)
Laughlin, Alex., & Co., Pittsburgh, Pa.
Whiting Fdy. Equipment Co., Harvey, Ill.

FURNACES (Electric)
Crowley, John A., Co., New York City
Industrial Elec. Furnace Co., 53 W. Jackson, Chicago.

PANGBORN EQUIPMENT MAKES THE BEST INVESTMENT

"ASK THOSE WHO KNOW BY WORKING COMPARISON"



"Pangborn" Type "G D" Barrel Sand Blast

A hygienic self-contained machine. Requires no pit or special foundation.

Built for heavy duty, with the interior of the drum entirely unobstructed, permitting the handling of pieces up to the limit of the door opening.

Continuous gravity feed. Uses sand or metal abrasives equally well. Made in three sizes.

"Pangborn" Type "LB" Rotary Table Sand Blast

Just the sand blast to speed up your light, fragile casting cleaning.

Blasting operation confined within the housing at rear of table. Operator protected by a sectional flexible curtain which also permits the passing of pieces.

Put your cleaning problems up to our engineering department.

PANGBORN CORPORATION
HAGERSTOWN, MD.
SAND-BLAST SPECIALISTS

P. O. BOX 558

FURNACES (Electric)—Continued
Ludlum Electric Furnace Corp., New York City
Moore, W. R., & Co., Pittsburgh, Pa.
Pittsburgh Furnace Co., 215 Sycamore, Milwaukee.

FURNACES (Forging)
Gilbert & Barker Mfg. Co.,
Union St., Springfield, Mass.

FURNACES (Heat Treating)
American Incandescent Heat Co., Inc.,
10 P. O. Square, Boston, Mass.

FURNACES (Melting)
Industrial Elec. Furnace Co., 52 W. Jackson, Chicago.
Ludlum Electric Furnace Corp., New York, N. Y.
Pittsburgh Furnace Co., 215 Sycamore, Milwaukee.

FURNACES (Open Hearth)
Lindsay, W. W., Co., Inc., 2 E. 15th St., Phila.
Miller, W. R., Co., Pittsburgh, Pa.
Orth, Frank, 3437 Fir St., Indiana Harbor, Ind.
Smythe, S. R., Co., Pittsburgh, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

FURNACES (Shrapnel)
Gilbert & Barker Mfg. Co.,
Union St., Springfield, Mass.
Metals Production Equipment Co., Springfield, Mass.

FURNACES (Water Cooled Specialties for Open Hearth)
Blaw-Knox Co., 602 Farmers Bank Bldg., Pittsburgh.

FURNACES (Wire Annealing)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GALVANIZING EQUIPMENT
American Bridge Co., New York City
Erie Foundry Co., Erie, Pa.

GALVANIZED WIRE (Equipment)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GASKETS (Leather)
Graton & Knight Mfg. Co., The, Worcester, Mass.

GAS BOOSTERS (Rotary Positive Pressure)
Connersville Blower Co., The, Connersville, Ind.
General Electric Co., Schenectady, N. Y.
Roots, P. H., & F. M., Co., Connersville, Ind.

GAS EXHAUSTERS
General Electric Co., Schenectady, N. Y.
Roots, P. H., & F. M., Co., Connersville, Ind.

GAS PRODUCERS
Chapman Engineering Co., Mt. Vernon, O.
Hagan, Geo. J., Co., Pittsburgh, Pa.
Koppers Co., The, Pittsburgh, Pa.
Miller, W. R., Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Smith Gas Engine Co., The, Dayton, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

GAS RECOVERY COKE OVENS
Koppers Co., The, Pittsburgh, Pa.

GEAR BLANKS
Akron-Selle Co., Akron, Ohio.
Camden Forge Co., Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Jersey Forging Works,
16th St. and Jersey Ave., Jersey City, N. J.

GEAR CUTTING MACHINERY
National Tool Co., Cleveland, Ohio.
Newton Machine Tool Works, Inc.,
23rd and Vine St., Philadelphia, Pa.
New York Machinery Exchange, Inc., N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.

GEAR TESTING MACHINERY
Gisholt Machine Co., Madison, Wis.

GEAR TURNING MACHINERY (Bevel)
Bridgeford Machine Tool Works,
155 Winton Rd., Rochester, N. Y.

GEARS AND GEAR CUTTING (Iron and Steel)
Akron Gear & Engineering Co., Akron, O.
American Steel Foundries, Chicago, Ill.
Falk Company, Milwaukee, Wis.
Farrell-Cheek Steel Foundry Co., Sandusky, O.
Farrel Foundry & Machine Co., Ansonia, Conn.
Fawcus Machine Co., Pittsburgh, Pa.
Grant Gear Wks., Inc., 151 Pearl St., Boston, Mass.
Hersburgh & Scott Co.,
5114 Hamilton Ave., Cleveland, O.
Hubbard Steel Fdy. Co., E. Chicago, Ind.
Link-Belt Company, Chicago, Ill.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., The, Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
National Roll & Foundry Co., Avonmore, Pa.
New Process Gear Corp., Syracuse, N. Y.
Newton Machine Tool Works, Inc.,
23rd and Vine St., Philadelphia, Pa.
Pittsburgh Iron & Steel Foundries, Pittsburgh.
Ross-Meehan Foundries, Chattanooga, Tenn.
Simonds Mfg. Co., Pittsburgh, Pa.
Sivyer Steel Casting Co., Milwaukee, Wis.
Taylor-Wharton Iron & Steel Co.,
High Bridge, N. J.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

GEARS (Herringbone)
Falk Company, Milwaukee, Wis.
Fawcus Machine Co., Pittsburgh, Pa.

GEARS (Rawhide)
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago
Grant Gear Works, Inc.,
151 Pearl St., Boston, Mass.
Hersburgh & Scott Co.,
5114 Hamilton Ave., Cleveland, O.
New Process Gear Corp., Syracuse, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

GEARS (Reverse, Marine)
Carlyle Johnson Mach. Co., Manchester, Conn.

GENERATORS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Wickes Brothers, Dept. A, Saginaw, Mich.

GENERATORS (Direct and Alternating Current)
Duquesne Electric & Mfg. Co., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

GENERATORS (Oxy-acetylene, oxygen, hydrogen)
Davis-Bournonville Co., Jersey City, N. J.
Electrolytic Oxy-Hydrogen Laboratories, Inc.,
New York City.

GLOVES AND MITS (Asbestos)
Holcomb Safety Garment Co.,
14 S. Jefferson St., Chicago, Ill.

GLOVES (Sand Blast)
Hickory Steel Grip Glove Co., Box No. R. 6, Chicago

GLOVES (Steel Grip)
Hickory Steel Grip Glove Co., Box No. R. 6, Chicago

GLOVES (Workman's)
Hickory Steel Grip Glove Co., Box No. R. 6, Chicago

GOGGLES
Standard Optical Co., Geneva, N. Y.

GOLD (Boronic All-Metal in Shot Form)
American Boron Products Co.,
636 Court St., Reading, Pa.

GRAPHITE
Dixon, Joseph, Crucible Co.,
Dept. 64-B, Jersey City, N. J.

GRATE BARS
Bowler Fdry. Co., 1692 Columbus Rd., Cleveland.

GREASES
Dixon, Joseph, Crucible Co.,
Dept. 64-B, Jersey City, N. J.
Texas Co., Dept. T, 17 Battery Pl., New York City.

GRINDERS (Inserted Tooth)
Hunter Saw & Machine Co., Pittsburgh, Pa.
Pittsburgh Saw & Mfg. Co.,
32nd and Smallman Sts., Pittsburgh, Pa.

GRINDING MACHINES
Blake & Johnson Co., Waterbury, Conn.
Cincinnati Electric Tool Co., Cincinnati, O.
Cleveland Pneumatic Tool Co., Cleveland, O.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., 3rd and French Sts., Erie, Pa.
Newton Machine Tool Works, Inc.,
23rd and Vine St., Philadelphia, Pa.
New York Machinery Exchange, Inc., N. Y. C.
Ransom Mfg. Co., Oshkosh, Wis.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.
Webster & Perks Tool Co.,
P. O. Box 1200 Springfield, O.
Wisconsin Electric Co., 3500 16th St., Racine, Wis.

GRINDING MACHINES (Tool)
Gisholt Machine Co., Madison, Wis.

GRINDING AND POLISHING MACHINERY, SUPPLIES AND ACCESSORIES
Webster & Perks Tool Co.,
P. O. Box 1200, Springfield, O.

GUARDS (Machinery)
Erdle Perforating Co., Rochester, N. Y.

GUIDES (Locomotive)
Camden Forge Co., Camden, N. J.

GUIDES (For Wire, Rod and Billet Mills)
Pittsburgh Iron & Steel Foundries Co., Pittsburgh.

HACK SAW BLADES
American Saw & Mfg. Co., Springfield, Mass.

HAMMERS
New York Machinery Exchange, Inc., N. Y. C.

HAMMERS (Drop)
Alliance Machine Co., Alliance, O.
Beaudry & Co., Inc., 141 Milk St., Boston, Mass.
Bliss, E. W., Co., 8 Adams St., Brooklyn, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Massillon Foundry & Mach. Co., Massillon, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.
Toledo Machine & Tool Co., Toledo, O.
Toomey, Frank, Inc., Philadelphia, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
United Hammer Co., Oliver Bldg., Boston, Mass.

HAMMERS (Link Welding)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

HAMMERS (Power)
Beaudry & Co., Inc., 141 Milk St., Boston, Mass.
Bradley, C. C., & Son, Inc., Syracuse, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cleveland Pneumatic Tool Co., Cleveland, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.
United Hammer Co., Oliver Bldg., Boston, Mass.
Williams, A. R., Machinery & Supply Co.,
Fidelity Bldg., Buffalo, N. Y.

HAMMERS (Rawhide)
Chicago Rawhide Mfg. Co.,
1301 Elston Ave., Chicago, Ill.

HAMMERS (Shell Nosing)
Beaudry & Co., Inc., 141 Milk St., Boston, Mass.
United Hammer Co., Oliver Bldg., Boston, Mass.

HAND PADS (Steel Grip)
Hickory Steel-Grip Glove Co., Box No. R. 6, Chicago.

HANGERS (Shaft)
Hyatt Roller Bearing Co., Industrial Bearing Div.,
Metropolitan Tower, New York.

HARDWARE (Wagon)
Cleveland Hardware Co., Cleveland, O.
Oliver Iron & Steel Co., Pittsburgh, Pa.

HEATERS (Feed Water)
Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa.

HEATING SYSTEMS
Buckeye Blower Co., Columbus, O.

HEAT INSULATING (Brick and Powder)
Celite Products Co., 11 Broadway, New York City
Magnesia Association of America, The,
Bulletin Bldg., Philadelphia, Pa.

HEAT TREATING
Bidle, W. S., Co., 1411 E. 45th St., Cleveland.
Steel Improvement & Forge Co., Cleveland, O.

HOISTING MACHINERY
Alliance Machine Co., Alliance, O.
Case Crane & Engineering Co., Columbus, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Dake Engine Co., Grand Haven, Mich.
Illinois Malleable Iron Co., Chicago, Ill.
Lakeside Bridge & Steel Co.,
123 Villard Ave., N. Milwaukee, Wis.
Link-Belt Company, Chicago, Ill.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Ridgway, Craig, & Son, Coatesville, Pa.
Shepard Elec. Crane & Hoist Co, Montour Falls, N.Y.
Toledo Bridge & Crane Co.,
2900 Dorr St., Toledo, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Williams, G. H., Co., Erie, Pa.

HOISTS (Chain)
Shepard Elec. Crane & Hoist Co, Montour Falls, N.Y.

HOISTS (Electric)
Euclid Crane & Hoist Co., Dept. B., Euclid, O.
Lakeside Bridge & Steel Co.,
123 Villard Ave., N. Milwaukee, Wis.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shepard Elec. Crane & Hoist Co, Montour Falls, N.Y.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

HOISTS (Pneumatic)
Shepard Elec. Crane & Hoist Co, Montour Falls, N.Y.

HOOPS AND BANDS
Illinois Steel Co., Chicago, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Sharon Steel Hoop Co., Sharon, Pa.
Weirton Steel Co., Weirton, W. Va.
West Leechburg Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

HOSE CLAMPS
Newark Stamping & Foundry Co., Newark, O.

HOSE (Pneumatic)
Cleveland Pneumatic Tool Co., Cleveland, O.
Oldham, Geo., & Sons Co., Frankford, Philadelphia.

HYDRAULIC MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Mackintosh-Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

HYDRAULIC PRESSES
Bethlehem Steel Co., Bethlehem, Pa.
New York Machinery Exchange, Inc., N. Y. C.
Southwark Fdy. & Mach. Co., Philadelphia, Pa.

HYDROGEN
International Oxygen Co., 115 Broadway, N. Y. C.
Wellman-Seaver-Morgan Co., Cleveland, O.

HYDROGEN GENERATING APPARATUS
Electrolytic Oxy-Hydrogen Laboratories, Inc.,
New York City.

INDUSTRIAL RAILWAYS
Koppel Industrial Car & Equip. Co., Koppel, Pa.
Lakewood Engineering Co., Cleveland, O.

INGOT AND OPEN HEARTH CHARGING CARS
Birdsboro Steel Fdy. & Machine Co., Birdsboro, Pa.
Pennsylvania Engrg. Works, New Castle, Pa.
Treadwell Engineering Co., Easton, Pa.

INGOT MOLDS
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdy. & Machine Co., Birdsboro, Pa.
Marshall Foundry Co., Pittsburgh, Pa.
Penn Mold & Mfg. Co., Wheeling, W. Va.
Pittsburgh Iron & Steel Foundries Co., Pittsburgh.
Valley Mould & Iron Corp., Sharpsville, Pa.

INGOT (Electric Furnace Steel)
Latrobe Electric Steel Co., Latrobe, Pa.

INGOTS (Steel)
Braddock Mfg. Co., Braddock, Pa.
McConway & Torley Co., Arsenal Station, Pittsburgh
Mesta Machine Co., Pittsburgh, Pa.
Penn Seab'd Steel Corp, Franklin Bank Bldg., Phila.

INSTRUMENTS (Electric Indicating and Recording)
Smith Gas Engrg. Co., The, Dayton, O.

INSULATING BRICK
Celite Products Co., 11 Broadway, New York City
Quigley Furnace Specialties Co, 26 Cortlandt, N.Y.C.

Reclamation

In war's devastated districts of Europe, a million homes must be rebuilt—a hundred thousand factories must be reconstructed—thousands of railroads, bridges and tunnels must be replaced.

This will create an enormous demand for material, machinery and other products of American industries and American labor.

Material will be as high, if not higher—labor will be as scarce, if not scarcer during this period of reclamation than during the period of destruction.

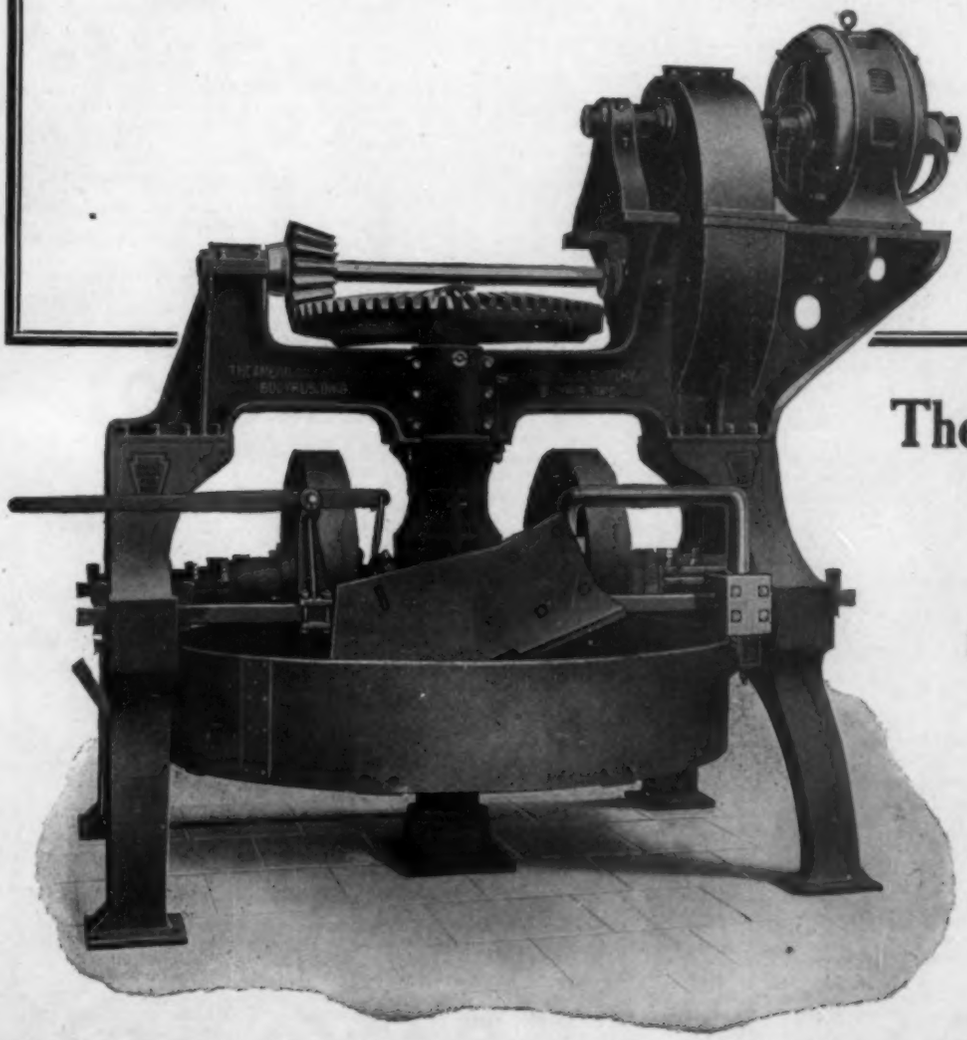
He is wise who continues to conserve.

BUILT RIGHT
RUN RIGHT

American Grinding Pans

will help you to conserve *time, labor* and *material* as you never before have done. They will *reclaim* worn out *furnace linings, core sand* and *facing sand.* They will *grind ganister* and used *fire brick* to a much greater advantage than any other method you have ever used.

Write for our Catalog.



The American Clay Machinery Company

BUCYRUS, OHIO

INSULATION (Cold Storage)
Armstrong Cork & Insulation Co., 101 24th St., Pittsburgh, Pa.

INSULATION (Furnaces, Boiler Settings, Ovens, Steam Pipe, Etc.)
Armstrong Cork & Insulation Co., 101 Twenty-fourth St., Pittsburgh, Pa.
Calite Products Co., 11 Broadway, New York City

IRON
Andrews Steel Co., Newport, Ky.
Beals, McCarthy & Rogers, Buffalo, N. Y.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Interstate Iron & Steel Co., 104 S. Michigan Ave., Chicago, Ill.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
McCalla, Harold, Philadelphia, Pa.
Monongahela Iron & Steel Co., Pittsburgh, Pa.
Newport Rolling Mill Co., Newport, Ky.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.
Vulcan Iron & Steel Co., Pittsburgh, Pa.
Whittaker-Glessner Co., Wheeling, W. Va.

IRON AND TIMBER LANDS
Neely, Benjamin C., Crystal Falls, Mich.

IRON (Bar)
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Monongahela Iron & Steel Co., Pittsburgh, Pa.
Vulcan Iron & Steel Co., Pittsburgh, Pa.

IRON (Boronic All-Metal in Shot Form)
American Boron Products Co., Inc., 636 Court St., Reading, Pa.

IRON (Ornamental)
Belmont Iron Works, Philadelphia, Pa.

IRON (Silvery)
Globe Iron Co., Jackson, O.

IRON (Vanadium)
Thomas Iron Co., The, Hokendauqua, Pa.

IRON ORE
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Breitung, E. N., & Co., Cleveland, O.
Cleveland-Cliffs Iron Co., Cleveland, O.
Hanna, M. A., & Co., Cleveland, O.
Hillman, J. H., & Sons Co., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Merritt, Franklin E., 514 Plymouth Bldg., Minneapolis.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.
Snyder, W. P., & Co., Pittsburgh, Pa.
Tod-Stambaugh Co., Cleveland, O.
Wharton Steel Co., New York City

IRON ORE (Manganiferous)
Marshall, Edward E., Bullitt Bldg., Philadelphia.

JIGS AND FIXTURES
Gisholt Machine Co., Madison, Wis.

JOLT RAMMING MACHINES
Pridmore, Henry E., Chicago, Ill.

KEYS AND COTTERS (Machine)
Latshaw Steel & Metal Products Corp., 261 Broadway, New York City
Leard, Wm., Co., New Brighton, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Morton Mfg. Co., Muskegon Heights, Mich.
Standard Gauge Steel Co., Beaver Falls, Pa.

KEYSEATERS
Baker Bros., Toledo, O.
New York Machinery Exchange, Inc., N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.

KNIVES (Circular)
Hunter Saw & Machine Co., Pittsburgh, Pa.
Pgh. Saw & Mfg. Co., 32nd and Smallman Sts., Pgh.

LADLES
Mitchell-Tappen Co., New York City
Pennsylvania Engrg. Works, New Castle, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

LADLE BRICK
McLain Fire Brick Co., Pittsburgh, Pa.

LAMP GUARDS
Flexible Steel Lacing Co., 522 S. Clinton St., Chgo.

LAMPS (Arc and Incandescent)
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

LATHE DOGS (Safety)
Williams, J. H., & Co., 58 Richards St., Brooklyn, N. Y.

LATHE TOOLS
Gisholt Machine Co., Madison, Wis.

LATHES
Acme Machine Tool Co., Cincinnati, O.
Bridgeford Machine Tool Works, 155 Winton Rd., Rochester, N. Y.
Bullard Machine Tool Co., Bridgeport, Conn.
Duplex Machinery Co., 532 Leader-News Bldg., Cleveland, O.
Greaves-Klusman Co., Cincinnati, O.
Jones & Lamson Mach. Co., Springfield, Vt.
Manning, Maxwell & Moore, Inc., 119 W. 40th St., New York City
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Warner & Swasey Co., Cleveland, O.
Wickes Brothers, Dept. A, Saginaw, Mich.
Williams, A. R., Machinery & Supply Corp., Fidelity Bldg., Buffalo, N. Y.

LATHES (Automatic and Semi-Automatic)
Gisholt Machine Co., Madison, Wis.

LATHES (Chucking, Vertical)
Bullard Machine Tool Co., Bridgeport, Conn.
Simmons Machine Co., Inc., Albany, N. Y.

LATHES (Engine)
Bridgeford Machine Tool Works. 155 Winton Rd., Rochester, N. Y.
Gisholt Machine Co., Madison, Wis.
New York Machinery Exchange, Inc., N. Y. C.
Toomey, Frank, Inc., Philadelphia, Pa.

LATHES (Horizontal Turret)
Gisholt Machine Co., Madison, Wis.

LATHES (Vertical Turret)
Bullard Machine Tool Co., Bridgeport, Conn.
New York Machinery Exchange, Inc., N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.
Williams, A. R., Machinery & Supply Co., Fidelity Bldg., Buffalo, N. Y.

LEAD
United Smelting & Al. Co., New Haven, Conn.

LEATHER (Hydraulic)
Graton & Knight Mfg. Co., Worcester, Mass.

LEATHER BELTING (See Belting, Leather)

LEATHER (Belt Lace)
Graton & Knight Co., Worcester, Mass.

LEG AND FOOT PROTECTORS
Holcomb Safety Garment Co., 12-14 S. Jefferson St., Chicago, Ill.

LETTERHEADS (Engraved)
Wiggins, John B., Co., 705 Peoples Gas Bldg., Chicago, Ill.

LIFTING MAGNETS
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.
Ohio Electric & Controller Co., 5900 Maurice Ave., Cleveland, O.

LIMESTONE
Davison, Allen S., Co., Pittsburgh, Pa.

LININGS (Cupola, Furnace and Forge)
American Fire Clay & Products Co., Cleveland, O.
Brighton Fire Brick Co., New Brighton, Pa.
Freeman Fire Brick Co., Steubenville, O.
Hydraulic-Press Brick Co., Fire Brick Dept., St. Louis, Mo.
Louisville Fire Brick Works, Highland Park, Ky.
Mutton Hollow Fire Brick Co., Woodbridge, N. J.

LINK BELTING
Link-Belt Company, Chicago, Ill.

LOADERS (For Wagons, Trucks R. R. Cars)
Haiss, George, Mfg. Co., Inc., 145th St. and Rider Ave., New York City

LOCKERS (Metal)
Edwards Mfg. Co., 401-451 Culvert St., Cincinnati

LOCOMOTIVE CRANES
Titan Equipment Co., New York City.
U. S. Crane Co., 112 S. Michigan Ave., Chicago, Ill.

LOCOMOTIVES
Koppel Industrial Car & Equip. Co., Koppel, Pa.
Vulcan Iron Wks., 1739 Main St., Wilkes-Barre, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

LOCOMOTIVES (Electric)
Atlas Car & Mfg. Co., Dept. E., Cleveland, O.
Baldwin Locomotive Works, Philadelphia, Pa.
Lakewood Engineering Co., Cleveland, O.

LOCOMOTIVES (Second Hand)
Duquesne Electric & Mfg. Co., Pittsburgh, Pa.
Railway & Mine Supply Co., 332 S. Michigan Ave., Chicago, Ill.
Railway & Power Equipment Co., New York City

LUBRICANTS
Dixon, Joseph, Crucible Co., Dept. 64-B, Jersey City, N. J.
Texas Co., Dept. T, 17 Battery Pl., N. Y. C.

LUMBER (Boxing, Crating, Flask, Pattern and Templet)
Smith, Fassett & Co., N. Tonawanda, N. Y.

MACHINE COUNTERS
Hart, R. A., Mfg. Co., 79 Wilson Court, Battle Creek, Mich

MACHINE KEYS (See Keys and Cotters, Machine)

MACHINE SHOP EQUIPMENT
Carpenter, Geo. B., & Co., Dept. 26, Chicago.

MACHINE WORK
Adamson Machine Co., Akron, O.
Blake & Johnson Co., Waterbury, Conn.
Challenge Machinery Co., Grand Haven, Mich.
Bliss, E. W., Co., 8 Adams St., Brooklyn, N. Y.
Case Crane & Engrg. Co., The, Columbus, O.
Diamond Machine Co., Monongahela, Pa.
Erie Foundry Co., Erie, Pa.
Gwynn Engineering Co., Pittsburgh, Pa.
Hill Pump Valve Co., Chicago, Ill.
Klotz Machine Co., Sandusky, O.
Lincoln Engineering Co., Main and Center Sts., Cleveland, O.
Link-Belt Company, Chicago, Ill.
Mackintosh-Hemphill & Co., Pittsburgh, Pa.
Manning, Maxwell & Moore, Inc., 119 W. 40th St., New York City
McKinnon Iron Works Co., Ashtabula, Ohio.
Metal Machining Co., The, Cleveland, O.
Morgan Engrg. Co., Alliance, O.
Newbold, E. S., Son & Co., Norristown, Pa.
Pgh. Valve, Foundry & Construction Co., Pittsburgh
Seiss Mfg. Co., Toledo, O.
Standard Tool & Mfg. Co., 70 Lafayette Blvd., E., Detroit, Mich.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
West Steel Castings Co., Cleveland, O.

MACHINERY (Pipe Bending)
American Pipe Bending Machine Co., 93 Pearl St., Boston, Mass.

MACHINERY (Second Hand) (See Used and Rebuilt Equipment)

MACHINERY (Special)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Cuyahoga Machine & Tool Co., 12416 Euclid Ave., Cleveland.
Lammert & Mann Co., Chicago, Ill.
Treadwell Engineering Co., Easton, Pa.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Yoder Co., The, Cleveland, O.

MAGNESITE
American Refractories Co., 208 S. La Salle St., Chicago, Ill.
Davison, Allen S., Co., Pittsburgh, Pa.

MAGNESITE (Calcined, Crude, Dead Burned)
Davison, Allen S., Co., Pittsburgh, Pa.

MANGANESE ORE
Lavino, E. J., & Co., Bullitt Bldg., Philadelphia
Marshall, Edward E., Bullitt Bldg., Philadelphia.

MARINE EQUIPMENT AND HARDWARE
Camden Forge Co., Camden, N. J.

MATCH PLATES
Newark Stamping & Foundry Co., Newark, O.

MERCHANTS STEEL BARS
Latshaw Steel & Metal Products Co., 261 Broadway, New York City.

METAL (Acid Proof)
Keystone Bronze Co., Pittsburgh, Pa.

METAL CLEANER
Ford, J. B., Co., Wyandotte, Mich.

METAL CUTTING MACHINES
Racine Tool & Machine Co., Racine, Wis.

METAL CUTTING TOOLS (Stellite)
Haynes Stellite Co., The, Kokomo, Ind.

METAL SPECIALTIES AND PARTS
Erdle Perforating Co., Rochester, N. Y.
Perfection Metal Products Co., College Point, N. Y.
White, L. & I. J., Co., 15 Columbia St., Buffalo, N. Y.

METAL STAMPING
Crosman Stamping Co., Ypsilanti, Mich.
Sess Mfg. Co., Brooklyn, N. Y.

METALLIC PAINT
Clinton Metallic Paint Co., Clinton, N. Y.

METALLURGISTS
Haynes Stellite Co., The, Kokomo, Ind.
Steel Improvement & Forge Co., Cleveland, O.

METAL (Perforated)
Erdle Perforating Co., Rochester, N. Y.

METALS (Non-Ferrous)
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Lubricating Metal Co., 2 Rector St., New York City.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

MILL AND MINE SUPPLIES
Colonial Supply Co., Pittsburgh, Pa.
Lunkenheimer Co., The, Cincinnati, O.

MILLING MACHINES
Becker Milling Machine Co., Boston, Mass.
Cincinnati Milling Mach. Co., Cincinnati, O.
Espen Lucas Machine Works, Front and Girard Ave., Philadelphia, Pa.
Gisholt Machine Co., Madison, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Newton Machine Tool Works, Inc., 23rd and Vine St., Philadelphia, Pa.
New York Machinery Exchange, Inc., N. Y. C.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.

MILLING MACHINES (Thread)
Gisholt Machine Co., Madison, Wis.

MILLING STAR PLATES
Newark Stamping & Foundry Co., Newark, O.

MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar)
Garrison, A., Foundry Co., Bingham St., Pgh.
Mesta Machine Co., Pittsburgh, Pa.
Treadwell Engineering Co., Easton, Pa.

MILLS (Boring and Turning, Vertical)
Bullard Machine Tool Co., Bridgeport, Conn.

MINING MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Link-Belt Company, Chicago, Ill.
McMyler Interstate Co., Cleveland, O.

MITTENS (Steel Grip)
Hickory Steel Grip Glove Co., Box No. R. 6, Chicago

MIXERS (Concrete)
Blaw-Knox Co., 602 Farmers Bank Bldg., Pittsburgh
Lakewood Engineering Co., Cleveland, O.
Smith, T. L., Co., Milwaukee, Wis.

MIXERS (Hot Metal)
Pennsylvania Engineering Works, New Castle, Pa.

MIXERS (Ore)
Lakewood Engineering Co., Cleveland, O.

MIXERS (Sand)
Lakewood Engineering Co., Cleveland, O.
National Engineering Co., Machinery Hall Bldg., 549 W. Washington St., Chicago, Ill.
Smith, T. L., Co., Milwaukee, Wis.

MIXING, KNEADING, TEMPERING AND PUGGING MACHINERY
American Clay Machinery Co., Bucyrus, Ohio.
National Engineering Co., Machinery Hall Bldg., 549 W. Washington St., Chicago, Ill.
Stevenson Co., The, Wellsville, Ohio.

MOLDS (Ingot)
Penn Mold & Mfg. Co., Wheeling, W. Va.
Valley Mould & Iron Co., Sharpsville, Pa.

Molders' Spring Knee Leggins

Asbestos Mittens

Asbestos Long Mitten

Asbestos Glove

Members Safety — UNIVERSAL SAFETY — National Council

Protecting your men protects your profits

And this is particularly true where the modern-day demand has brought high-pressure production into almost every plant.

Providing the men with garments that really protect them, makes for loyalty; stoppage of serious accidents and increased production and profits.

Holcomb's Universal Safety Garments include Asbestos Mittens, Asbestos Gloves, Asbestos, Leather and Duck Hip Leggins, Spring Knee Leggins in Asbestos, Leather and Duck, Asbestos and Duck Aprons, Asbestos Suits, or special garments to suit unusual conditions.

Get at once our quotation for *Holcomb* Equipping your entire plant

Holcomb Safety Garment Co.

14 So. Jefferson Street
Chicago, Ill.

T. V. JOHNSON'S
Seasoned Stock—

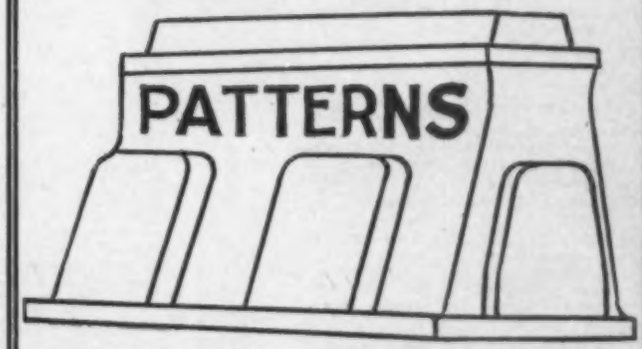
The best patterns are always produced from SEASONED DRY STOCK. It can always be depended upon and will not shrink, check or crack. You can't buy thoroughly seasoned stock everywhere — but you CAN get it from us.

Order now and insure prompt delivery. We can also furnish you any quantity of TEMPLET or FLASK LUMBER, straight or mixed cars.

Write for prices.

THOMAS V. JOHNSON, Inc.
1532 First National Bank Building
MILWAUKEE WISCONSIN

DEPENDABLE



Pattern-makers need good bone dry soft WHITE PINE LUMBER because with it they can build patterns that will not warp or twist out of shape while in the sand, assuring the moulders of a good clean draw every time.

We can supply bone dry WHITE PINE PATTERN LUMBER.

SMITH, FASSETT & CO.

Manufacturers and Wholesale Merchants
North Tonawanda New York

MOLDING MACHINES
Arcade Mfg. Co., Dept. C, Freeport, Ill.
Pridmore, Henry E., Chicago, Ill.

MOLDING (Automobile)
Empire Art Metal Co., College Pt., N. Y.

MONEL METAL
Williams & Co., Inc., 220-226 Penn Ave., Pgh.

MOTORS
Wickes Brothers, Dept. A, Saginaw, Mich.

MOTORS (Air)
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

MOTORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Duquesne Electric & Mfg. Co., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
MacGovern & Co., Inc., New York City
Wisconsin Elec. Co., 3500 16th St., Racine, Wis.

MOTORS (Second Hand)
Dotterweich, A. J., Co., Inc., Buffalo, N. Y.
Duquesne Electric & Mfg. Co., Pittsburgh, Pa.
Klein, Nathan, & Co., Inc., New York City
MacGovern & Co., Inc., New York City

MOTOR TRUCKS
Federal Motor Truck Co., Detroit, Mich.

MUFFLERS (Wire Mill Equipment)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

NAIL MACHINERY (Wire)
Kilby Mfg. Co., Cleveland, O.
National Machinery Co., Tiffin, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

NAILS
Cambria Steel Co., Philadelphia, Pa.
Interstate Iron & Steel Co.,
104 S. Michigan Ave., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Pittsburgh Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

NAME PLATES (Cast Bronze, Stamped and Etched)
Pannier Bros. Stamp Co., 207-209 Sandusky St, Pgh.

NICKEL
Baker, H., & Co., Inc., 101 Duane St., N. Y. C.

NICKEL (Barenic All-Metal in Shot Form)
American Barene Products Co., Inc.,
636 Court St., Reading, Pa.

NUTS (See Bolts and Nuts)

NUTS (Semi-Finished)
Camden Forge Co., Camden, N. J.

OIL (Fuel)
Clarendon Refining Co., Oliver Bldg., Pittsburgh.
Paragon Refining Co., Toledo, O.
Sloan & Zook, Bradford, Pa.
Warren Oil Co., of Pennsylvania, Warren, Pa.

OIL (Lubricating)
Texas Co., Dept. T., 17 Battery Place, N. Y. C.

OPEN HEARTH FURNACES (See Furnaces—Open-Hearth)

ORE (Chrome)
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.

ORE DOCKS
American Bridge Co., New York City

ORE HANDLING MACHINERY
Brown Hoisting Machinery Co., Cleveland, O.
Hayward Co., The, 50-54 Church St., N. Y. C.
Wellman-Seaver-Morgan Co., Cleveland, O.

OVENS (Coke, By-Product Recovery)
Koppers Co., The, Pittsburgh, Pa.

OXY-ACETYLENE WELDING AND CUTTING
Air Reduction Co., 120 Broadway, New York City.
Davis-Bournonville Co., Jersey City, N. J.
Linde Air Products Co., New York City
Oxweld Acetylene Co., Chicago, Ill.

OXYGEN
Davis-Bournonville Co., Jersey City, N. J.
International Oxygen Co., 115 Broadway, N. Y. C.
Linde Air Products Co., New York City

OXYGEN AND HYDROGEN GENERATING EQUIPMENT
Electrolytic Oxy-Hydrogen Laboratories, Inc.,
New York City.

PACKING (Leather)
Graton & Knight Mfg. Co., Worcester, Mass.

PACKING (Metallic)
Lubricating Metal Co., 2 Rector St., New York City

PAINT (Silica-Graphite)
Dixon, Joseph, Crucible Co.,
Dept. 64-B, Jersey City, N. J.

PANS (Lathe and Shop)
American Bridge Co., New York City

PATTERN LETTERS
Shanafelt Mfg. Co., Canton, O.

PATTERN LUMBER
Johnson, Thomas V., Inc., 1532 1st Nat. Bk. Bldg., Milwaukee
Smith, Fassett & Co., North Tonawanda, N. Y.

PATTERN PLATES (Aluminum)
Newark Stamping & Foundry Co., Newark, O.

PATTERN PLATES (Steel)
Moltrup Steel Products Co., Beaver Falls, Pa.

PATTERNS (Electric Furnace)
Acme Steel & Malleable Iron Wks., Buffalo, N. Y.

PATTERNS (Wood and Metal)
Anderson Pattern Works, 924 W. 12th St., Erie, Pa.
Arcade Mfg. Co., Dept. C, Freeport, Ill.
Canton Pattern & Mfg. Co., Canton, Ohio.
Diamond Machine Co., Monongahela, Pa.
Empire Art Metal Co., College Pt., N. Y.
Hammond Malleable Iron Co., Hammond, Ind.
Johnston Pattern Co., 320 Rex Ave., Canton, O.
Marion Malleable Iron Works, Marion, Ind.
Newark Stamping & Foundry Co., Newark, O.
Pridmore, Henry E., Chicago, Ill.
Smith, E. M., & Co., Peoria, Ill.
Wellman Products Co., Cleveland, O.

PATTERN SHOP SUPPLIES
Shanafelt Mfg. Co., Canton, O.

PERFORATED METAL
Erdle Perforating Co., Rochester, N. Y.

PIERCING POINTS, PLUGS AND BALLS (For Tube Mills)
Pittsburgh Iron & Steel Foundries Co., Pittsburgh.

PIG IRON
Addy, The, Matthew, Co., Cincinnati, O.
Baird & West, Detroit, Mich.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Central Iron & Steel Co., Harrisburg, Pa.
Cleveland-Cliffs Iron Co., Cleveland, O.
Crocker Bros., New York City
Davison, Allen S., Co., Pittsburgh, Pa.
Delaware River Steel Co., Chester, Pa.
Donner Steel Co., Inc., Buffalo, N. Y.
Globe Iron Co., Jackson, O.
Hanna, M. A., & Co., Cleveland, O.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
McKeefrey & Co., Leetonia, O.
Mitchell-Diggins Iron Co., Cadillac, Mich.
Mohr, J. J., & Son, Philadelphia, Pa.
Mudge, Edward W., & Co., Pittsburgh, Pa.
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
Rogers, Brown & Co., Cincinnati, O.
Snyder, W. P., & Co., Pittsburgh, Pa.
Stewart Iron Co., Ltd., Cleveland, O.
Struthers Furnace Co., The, Cleveland, O.
Superior Charcoal Iron Co., Grand Rapids, Mich.
Tennessee Coal, Iron & R. R. Co.,
Birmingham, Ala.
Thomas Furnace Co., Milwaukee, Wis.
Thomas Iron Co., The, Hokendauqua, Pa.
Wharton Steel Co., Wharton, N. J.
Wickwire Steel Co., Buffalo, N. Y.

PILE DRIVERS
Industrial Works, Bay City, Mich.

PILING (Creosoted)
Jennison-Wright Co., 2435 Broadway, Toledo, O.
Republic Creosoting Co., Indianapolis, Ind.

PILING (Steel Sheet)
Carnegie Steel Co., Pittsburgh, Pa.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.

PINIONS (See Gears and Gear Cutting)

PINS
Camden Forge Co., Camden, N. J.

PIPE (Culvert)
Newport Rolling Mill Co., Newport, Ky.

PIPE (Iron and Steel)
Amalgamated Products Co., 165 Broadway, N. Y. C.
American Bridge Co., New York City
American Steel Export Co., New York City
Byers, A. M., Co., Pittsburgh, Pa.
Central Tube Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
La Belle Iron Works, Steubenville, O.
Mark Mfg. Co., 1907 Dempster St., Evanston, Ill.
National Tube Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
U. S. Cast Iron Pipe & Foundry Co.,
730 E. Pearl St., Burlington, N. J.
Vulcan Steel Products Co., 120 Broadway, N. Y. C.
Wheeling Steel & Iron Co., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE (Wrought Iron)
Byers, A. M., Co., Pittsburgh, Pa.

PIPE BENDING MACHINES
American Pipe Bending Machine Co.,
93 Pearl St., Boston, Mass.

PIPE BENDS
Pittsburgh Piping & Equipment Co., Pgh.

PIPE COVERING (Steam and Cold Water)
Magnesia Association of America,
Bulletin Bldg., Philadelphia, Pa

PIPE FITTINGS
Illinois Malleable Iron Co., Chicago, Ill.
Lunkenheimer Co., The, Cincinnati, O.
Pittsburgh Piping & Equip. Co., Pittsburgh, Pa.
Pgh. Valve, Foundry & Construction Co., Pgh.
Power Piping Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

PIPE MACHINES
New York Machinery Exchange, Inc., N. Y. C.

PIPE MILL MACHINERY
Landis Machine Co., Waynesboro, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

PIPE THREADING MACHINERY
Standard Engrg. Co., Elwood City, Pa.
Toomey, Frank, Inc., Philadelphia, Pa.

PIPING CONTRACTORS
Pittsburgh Piping & Equip. Co., Pittsburgh, Pa.
Power Piping Co., Pittsburgh, Pa.

PISTON RODS
Bay City Forge Co., Erie, Pa.
Camden Forge Co., Camden, N. J.
Heppenstall Forge & Knife Co., Pittsburgh, Pa.

PLANERS
Cincinnati Planer Co., Cincinnati, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
Manning, Maxwell & Moore, Inc.,
119 W. 40th St., New York City
Morton Mfg. Co., Muskegon Heights, Mich.
Newton Ma. Tool Wks., Inc., 23d and Vine St., Phila.
New York Machinery Exchange, Inc., N. Y. C.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.

PLATES (Rolled Steel—Floor)
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.

PLATES (Sheared and Universal)
Allegheny Steel Co., Pittsburgh, Pa.
Belmont Iron Works, Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Central Iron & Steel Co., Harrisburg, Pa.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Wachouse Dept., Chicago, Ill.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Nagle Steel Co., Pottstown, Pa.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
Republic Structural Iron Works, Cleveland, O.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., 1127 New Continental & Commercial Bank Bldg., Chicago, Ill.
Sharon Steel Hoop Co., Sharon, Pa.
Shippers Car Line, New York City
Tennessee Coal, Iron & R. R. Co.,
Birmingham, Ala.
Whitaker-Glessner Co., Wheeling, W. Va.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Worth Bros. Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

PLATES (Ship & Boiler)
Midvale Steel & Ordnance Co., Philadelphia, Pa.

PLATES (Terne and Tin)
American Sheet & Tin Plate Co., Pittsburgh, Pa.

PLATING
Bellevue Mfg. Co., Bellevue, Ohio.

PLUNGERS (For Pumps)
Camden Forge Co., Camden, N. J.
Pittsburgh Iron & Steel Foundries Co., Pgh.

POINTERS (Wire and Rod)
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

POLISHERS AND BUFFERS (Electric)
Wisconsin Electric Co., 3500 16th St., Racine, Wis.

POLISHING MACHINERY
Webster & Perks Tool Co.,
P. O. Box 1200, Springfield, O.

POWDERED COAL EQUIPMENT
Bonnot Co., The, Canton, O.
Fuller-Lehigh Co., Fullerton, Pa.
Quigley Furnace Spec. Co., 26 Cortlandt St., N. Y. C.
Raymond Bros. Impact Pulverizer Co.,
1313 N. Branch St., Chicago, Ill.
Stevenson Co., The, Wellsville, O.

POWER TOOLS
Southwark Foundry & Mach. Co., Philadelphia, Pa.

POWER TRANSMITTING MACHINERY
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Link-Belt Co., Chicago, Ill.
Treadwell Engineering Co., Easton, Pa.
Westinghouse Elec. & Mfg. Co., E. Pgh., Pa.

PRESSED METAL
Empire Art Metal Co., Inc., College Pt., N. Y.
Gier Pressed Steel Co., Lansing, Mich.

PRESSES
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.
Bliss, E. W., Co., 8 Adams St., Brooklyn, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Garrison, A., Foundry Co., Bingham St., Pgh.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Massillon Foundry & Mach. Co., Massillon, O.
Mesta Machine Co., Pittsburgh, Pa.
Michigan Machine Tool & Foundry Co.,
Ypsilanti, Mich.
Morgan Engineering Co., Alliance, O.
New York Machinery Exchange, Inc., N. Y. C.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Toledo Machine & Tool Co., Toledo, O.
Toomey, Frank, Inc., Philadelphia, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wood, R. D., & Co., Philadelphia, Pa.

PRESSURE GAGES
Clark, Chas. J., Chicago, Ill.

PRESSURE REGULATORS
Connersville Blower Co., The, Connersville, Ind.

PULLEYS (Friction Clutch)
Carlyle Johnson Mach. Co., Manchester, Conn.

Right ROLLS Service

ROLLS

Carbon Steel Alloy Steel or Iron
Sand or Chilled Iron

ROLLING MILLS
Open Hearth and
Converter Steel Castings

ROLLING MILL EQUIPMENT
Air Furnace
Iron Castings

"ROLLS that are RIGHT"

PHILADELPHIA ROLL & MACHINE COMPANY

25th Street and Washington Avenue, PHILADELPHIA, PA.

Subsidiary of

TAYLOR-WHARTON IRON & STEEL COMPANY

Other Plants:

TAYLOR-WHARTON IRON & STEEL CO., HIGH BRIDGE, N. J.
WM. WHARTON, JR., & CO., INCORPORATED, EASTON, PA.
TIOGA STEEL & IRON COMPANY, PHILADELPHIA, PA.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Chambersburg Engrg. Co., Chambersburg, Pa.
Connersville Blower Co., The, Connersville, Ind.
Dean Bros. Steam Pump Works, Indianapolis, Ind.
Deming Co., Salem, O.
Boots, P. H., & F. M., Co., Connersville, Ind.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Vulcan Iron Wks., 1739 Main St., Wilkes-Barre, Pa.

PUMPS (Centrifugal)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

PUMPS (Motor Driven)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

PUNCHING AND SHEARING MACHINERY
Alliance Machine Co., Alliance, O.
Bliss, E. W., Co., 8 Adams St., Brooklyn, N. Y.
Cleveland Punch & Shear Works Co., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Excelsior Tool & Machine Co., E. St. Louis, Ill.
Garrison, A., Foundry Co., Bingham St., Pgh.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
New York Machinery Exchange, Inc., N. Y. C.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Quickwork Co., St. Marys, O.
Richards, I. P., Providence, R. I.
Simmons Machine Co., Inc., Albany, N. Y.
Southwark Foundry & Machine Co., Philadelphia.
Thomas Spacing Machine Co., Pittsburgh, Pa.
Toomey, Frank, Inc., Philadelphia, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wickes Brothers, Dept. A., Saginaw, Mich.
Wood, R. D., & Co., Philadelphia, Pa.

PYROMETERS
Brown Instrument Co., Philadelphia, Pa.

RACKS (Steel or Tool)
Empire Art Metal Co., Inc., College Pt., N. Y.

RAIL JOINTS
Carnegie Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.

RAILROAD SUPPLIES
American Steel Export Co., New York City
Carpenter, Geo. B., & Co., Dept. 26, Chicago.

RAILS
American Steel Export Co., New York City
Atlantic Equipment Co., New York City
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Fishel & Marks Co., Cleveland, O.
Green, L. A., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.

RAILS (Girder)
Bethlehem Steel Co., The, So. Bethlehem, Pa.

RAILS (High Tee)
Bethlehem Steel Co., The, So. Bethlehem, Pa.

RAPPING PLATES
Shanafelt Mfg. Co., Canton, O.

REAMERS
Cleveland Power Transmission Co., Cleveland, O.
Detroit Reamer & Tool Co., Detroit, Mich.
Jaeger, M., 342 Engineers Bldg., Cleveland, O.
National Tool Co., Cleveland, Ohio.

REAMERS (Bridge)
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.

REAMERS (Expanding)
Gisholt Machine Co., Madison, Wis.

RECORDERS (Time)
Gisholt Machine Co., Madison, Wis.

RECORDING GAGES
Brown Instrument Co., Philadelphia, Pa.

REELS (Wire Mill Equipment)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

RHEOSTATS
Electric Controller & Mfg. Co., Cleveland, O.

RINGS (Forged Steel)
Akron-Selle Co., The, Akron, O.
Camden Forge Co., Camden, N. J.

RINGS (Steel and Weldless)
Bay City Forge Co., Erie, Pa.
Camden Forge Co., Camden, N. J.

RIVETING MACHINERY
Allen, John F., Co., 372 Gerard Ave., N. Y. C.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cleveland Pneumatic Tool Co., Cleveland, O.
Oldham, Geo., & Sons Co., Frankford, Phila.
Shuster, The F. B., Co., New Haven, Conn.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Wood, R. D., & Co., Philadelphia, Pa.

RIVETS
Bethlehem Steel Co., Bethlehem, Pa.
Carlin, The Anthony, Co., Cleveland, O.
Illinois Steel Co., Warehouse Dept., Chicago, Ill.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co.,
104 S. Michigan Ave., Chicago, Ill.
National Bolt & Nut Co., Pittsburgh, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Progressive Mfg. Co., Torrington, Conn.
Russell, Burdsall & Ward Bolt & Nut Co.,
Port Chester, N. Y.
Everson, Jos. T., & Son, Chicago, Ill.

RODS
United Smelting & Al Co., New Haven, Conn.

RODS (Brass)
Williams & Co., Inc., 220-226 Penn Ave., Pgh.

RODS (Connecting)
Bay City Forge Co., Erie, Pa.
Camden Forge Co., Camden, N. J.
Leard, Wm., Co., New Brighton, Pa.

RODS (Drill)
Abarn Steel Co., Inc., 24 Clarks St., New York City
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.
Kidd Drawn Steel Co., Aliquippa, Pa.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.

RODS (Iron and Steel)
American Steel Export Co., New York City
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Federal Export Corp., 42 Broadway, New York City
Liberty Steel Products Co., New York City

RODS (Welding)—See WELDING RODS

ROLLING MILL BEARINGS
Hyatt Roller Bearing Co., Industrial Bearing Division, Metropolitan Tower, New York City.

ROLLING MILLS (For Laboratory Use)
Crocker, Samuel A., Co., Cincinnati, O.

ROLLING MILL EQUIPMENT
Abramsen Engrg. Co., Pittsburgh, Pa.
Alliance Machine Co., Alliance, O.
Birdsboro Steel Fdy. & Machine Co., Birdsboro, Pa.
Blake & Johnston Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Foundry Co., Bingham St., Pgh. Pa.
Hubbard Steel Fdy. Co., E. Chicago, Ind.
Hyde Park Fdy. & Mch. Co., Hyde Park, Pa.
Industrial Works, Bay City, Mich.
Lewis Foundry & Machine Co., The, Pgh., Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Mitchell-Tappan Co., New York City
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., Alliance, O.
National Roll & Foundry Co., Avonmore, Pa.
Newbold, E. S., & Son Co., Norristown, Pa.
Philadelphia Roll & Machine Co., Philadelphia, Pa.
Standard Engineering Co., Ellwood City, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.

ROLLS
American Steel Foundries, Chicago, Ill.
Bay City Forge Co., Erie, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Birdsboro Steel Fdy. & Machine Co., Birdsboro, Pa.
Camden Forge Co., Camden, N. J.
Farrel Fdy. & Mach. Co., Ansonia, Conn.
Garrison, A., Foundry Co., Bingham St., Pgh., Pa.
Hubbard Steel Fdy. Co., E. Chicago, Ind.
Hyde Park Fdy. & Mch. Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., The, Pgh., Pa.
Mackintosh-Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
National Roll & Foundry Co., Avonmore, Pa.
Philadelphia Roll & Machine Co., Philadelphia, Pa.
Pittsburgh Iron & Steel Foundries Co., Pgh., Pa.
Pittsburgh Rolls Corporation, Pittsburgh, Pa.
Seaman, Sleeth & Co., Pittsburgh, Pa.
Standard Engrg. Co., Ellwood City, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Youngstown Fdy. & Mch. Co., Youngstown, O.

ROLLS (Bending and Straightening)
Camden Forge Co., Camden, N. J.
Mackintosh-Hemphill & Co., Pittsburgh, Pa.
New York Machinery Exchange, Inc., N. Y. C.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wickes Brothers, Dept. A, Saginaw, Mich.

ROLLS (Wood)
Dart, E. M., Mfg. Co., Providence, R. I.

ROOFING AND SIDING (Composite)
American Sheet & Tin Plate Co., Pittsburgh, Pa.
Texas Co., Dept. T, 17 Battery Pl., New York City

ROOFING AND SIDING (Iron and Steel)
American Sheet & Tin Plate Co., Pittsburgh, Pa.
Inland Steel Co., The, Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Newport Rolling Mill Co., Newport, Ky.
Whitaker-Glessner Co., Wheeling, W. Va.

ROPE (Manila)
Waterbury Company, 63 Park Row, New York City

ROPE DRESSING
Macomber & Whyte Rope Co., Kenosha, Wis.
Texas Co., Dept. T, 17 Battery Pl., New York City

SAFE ENDS (Boiler Tube)
National Tube Co., Pittsburgh, Pa.
Worth Brothers Co., Philadelphia, Pa.

SAFETY DEVICES (Electric)
Electric Controller & Mfg. Co., Cleveland, O.

SAND
Gordon Sand Co., Inc., The, Conneaut, O.
Standard Sand & Machine Co., Cleveland, O.

SAND BLAST (Shot)
Globe Steel Co., Mansfield, O.

SAND BLAST EQUIPMENT AND ACCESSORIES
Amer. Fdy. Equip. Co., 52 Vanderbilt Ave., N. Y. C.
Pangborn Corporation, Hagerstown, Md.

SAND BLAST GLOVES
Hickory Steel-Grip Glove Co., Box, No. R. 6, Chgo.

SAND BLAST SAND
Portage Silica Co., The, Youngstown, O.

SAND CONVEYING AND HANDLING MACHINERY
Bartlett & Snow, C. O., Co., Cleveland, O.
Hains, George, Mfg. Co., Inc.,
145th St. and Rider Ave., New York City
Link-Belt Company, Chicago, Ill.
Standard Sand & Machine Co., Cleveland, O.

SAND DRYERS
Bartlett & Snow, C. O., Co., Cleveland, Ohio.
Pangborn Corporation, Hagerstown, Md.

SAND MIXERS, CUTTERS AND SIFTERS
Arcade Mfg. Co., Dept. C, Freeport, Ill.
National Engineering Co., Machinery Hall Bld.,
549 W. Washington St., Chicago, Ill.
Sand Mixing Machine Co., 52 Vanderbilt Ave.,
New York City
Smith, T. L., Co., Milwaukee, Wis.
Standard Sand & Machine Co., Cleveland, O.
Stevenson Co., The, Wellsville, O.
Whiting Foundry Equip. Co., Harvey, Ill.

SAND RECLAIMERS
American Clay Machinery Co., Bucyrus, O.

SAND SEPARATOR
Pangborn Corporation, Hagerstown, Md.

SAW BLADES (Hack Saws)
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.

SAW BLADES (Inserted Tooth)
Disston, Henry, & Sons, Inc., Philadelphia, Pa.
Pgh. Saw & Mfg. Co., 32d and Smallman Sts., Pgh.

SAW SHARPENING MACHINERY
Disston, Henry, & Sons, Inc., Philadelphia, Pa.
Hunter Saw & Machine Co., Pittsburgh, Pa.
Pgh. Saw & Mfg. Co., 32d and Smallman Sts., Pgh.

SAWS (Cold and Hot Metal)
Disston, Henry, & Sons, Inc., Philadelphia, Pa.
Espen-Lucas Mach. Wks., Front and Girard Av., Phila.
Hunter Saw & Machine Co., Pittsburgh, Pa.
Huther Bros. Saw & Mfg. Co.,
1107 University Ave., Rochester, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
National Roll & Foundry Co., Avonmore, Pa.
Newton Machine Tool Wks., 23d and Vine St., Phila.
New York Machinery Exchange, Inc., N. Y. C.
Peerless Machine Co., 1605 Racine St., Racine, Wis.
Pgh. Saw & Mfg. Co., 32d and Smallman Sts., Pgh.
Racine Tool & Machine Co., Racine, Wis.
Simmons Machine Co., Inc., Albany, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

SCALES
Standard Scale & Supply Co., Pittsburgh, Pa.

SCREENS AND SIEVES
Erdle Perforating Co., Rochester, N. Y.
Hains, George, Mfg. Co., Inc.,
145th St. and Rider Ave., New York
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Company, Chicago, Ill.
Wright Wire Co., Worcester, Mass.

SCREW MACHINE PRODUCTS
Atlantic Mfg. Co., The, Milford, Conn.
Barnes, Wallace, Co., 118 South St., Bristol, Conn.
Corbin Screw Corp., New Britain, Conn.
Ferry Cap & Set Screw Co.,
2151 Scranton Rd., Cleveland, O.
Metal Machining Co., The, Cleveland, O.
Metal Machining Tool Co., Cleveland, O.
Moore, George W., 44 Farnsworth St., Boston, Mass.
Standard Screw Products Co., Detroit, Mich.

SCREW MACHINES
Acme Machine Tool Co., Cincinnati, O.
New York Machinery Exchange, Inc., New York City
Simmons Machine Co., Inc., Albany, N. Y.
Warner & Swasey Co., Cleveland, O.

SCREW STOCK (Free Cutting)
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Miner-Morse Corp., 15th and Ash Sts., Erie, Pa.

SCREWS
Clark Bros. Bolt Co., Millidale, Conn.
Corbin Screw Corp., New Britain, Conn.
Ferry Cap & Set Screw Co.,
2151 Scranton Rd., Cleveland, O.
F. P. Screw Co., 2279 E. 77th St., Cleveland, O.
Milton Mfg. Co., Milton, Pa.
Progressive Mfg. Co., Torrington, Conn.
Russell, Burdsall & Ward Bolt & Nut Co.,
Port Chester, N. Y.

SCREWS (Cap and Set)
Ferry Cap & Set Screw Co.,
2151 Scranton Rd., Cleveland, O.

SEATING (Industrial)
Royal Metal Mfg. Co., S. Western Ave., Chicago.

SEPARATORS (Moisture—Oil)
Pangborn Corporation, Hagerstown, Md.

SHAFT HANGERS
Hyatt Roller Bearing Co., Industrial Bearing Division, Metropolitan Tower, New York
New Departure Mfg. Co., Bristol, Conn.

SHAFTING
American Vanadium Co., The, Pittsburgh, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Cumberland Steel Co., Cumberland, Md.
Donner Steel Co., Inc., Buffalo, N. Y.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Miner-Morse Corp., 15th and Ash Sts., Erie, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
National Tube Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Standard Gauge Steel Co., Beaver Falls, Pa.
Union Drawn Steel Co., Beaver Falls, Pa.
Ward's, Edgar T., Sons Co.,
44 Farnsworth St., Boston, Mass.

SHAFTING (Cold Drawn)
Bethlehem Steel Co., Bethlehem, Pa.
Reese Metal Prod. Co., Inc., 87 Nassau St., N. Y. C.

CASTINGS

Open Hearth Castings
Thirty Tons a Day

Our ten-ton Open Hearth Furnace permits us to take care of a considerably increased tonnage of open hearth castings, in addition to our facilities for making converter steel castings. We solicit your inquiries.

The Adamson Machine Co.
Akron, Ohio

Sharon Foundry Co.
STEEL CASTINGS
ACID OPEN HEARTH

We solicit your business and guarantee satisfaction

Sharon, Pa.

STEEL CASTINGS
(Mild and High Carbon Steel)
also
Alloy Iron Die Liners, Drawing Rings and Piercing Points.
Clean—Sound—True to Pattern
Personal Attention—Prompt Shipments
St. Louis Steel Foundry Co., 1501 Kienlen Ave., St. Louis, Mo.

SERVICE QUALITY VALUE
GEO. H. SMITH STEEL CASTING CO.
MILWAUKEE, WIS.
CONVERTER and Open HEARTH STEEL CASTINGS
Electrical--Machinery--Tractor--Auto Truck--Special Carbon--Etc.
Unsurpassed for--Strength--Durability and Machining Qualities.
Chicago Office: 1657 Conway Bldg. J. B. MARSHALL

Open Hearth Steel Castings
OF EVERY KIND AND DESCRIPTION
TO 2000 POUNDS
Inquiries solicited. Quick Deliveries.
STANDARD CRUCIBLE STEEL CASTING CO.
MILWAUKEE, WISCONSIN

Strong Steel Foundry Co.
Manufacturers of
Acid Open Hearth
STEEL CASTINGS
of Finest Quality
From 1 Pound to 20,000 Pounds

Gear Blanks and Pipe Fittings Our Specialties
Small Steel Castings in Large Quantities at Low Prices.
You want the best, send us your drawings for estimates
Office and Works 33 Norris Street Buffalo, New York

STEEL CASTINGS
FOR SUPERHEATED STEAM LINES and EXTREME HYDRAULIC SERVICE
Send Drawings and Specifications for Prices
Steel Booklet on Request
The Kelly & Jones Co., Works GREENSBURG, PA.
New York Pittsburg Chicago St. Louis Cincinnati San Francisco

National Foundry Co.
ACID OPEN HEARTH
STEEL CASTINGS
Also Gray Iron Castings
ERIE, PA.

Atlas Steel Casting Company
General Office and Works:
BUFFALO, N. Y.
Acid Open Hearth Steel Castings Exclusively
Frank D. Moffat & Co., New York and New England Sales Agent, 81 Fulton Street, New York

STEEL CASTINGS
HIGHEST QUALITY BS BEST SERVICE
BURNSIDE STEEL CO.
RAILWAY EXCHANGE CHICAGO

SHAPERS
Cleveland Punch & Shear Works Co., Cleveland, O.
Manning, Maxwell & Moore, Inc., 119 W. 40th St., New York City
Morton Mfg. Co., Muskegon Heights, Mich.
Newton Machine Tool Works, Inc., 23rd and Vine St., Philadelphia, Pa.
New York Machinery Exchange, Inc., N. Y. C.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.

SHAPES (Iron and Steel)
Belmont Iron Works, Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Columbia Steel & Shafting Co., Pittsbugh, Pa.
Empire Art Metal Co., Inc., College Pt., N. Y.
Illinois Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., 104 S. Michigan Ave., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Perfection Metal Products Co., College Point, N. Y.
Phoenix Iron Co., 410 Walnut St., Philadelphia, Pa.
Republic Iron & Steel Co., Youngstown, O.
Shippers Car Line, New York City
Ward's, Edgar T., Sons Co., 54 Farnsworth St., Boston, Mass.

SHEAR BLADES AND KNIVES
Cleveland Knife & Forge Co., Cleveland, O.
Heppenstall Forge & Knife Co., Pittsburgh, Pa.
Pittsburgh Knife & Forge Co., Pittsburgh, Pa.
Tinker, F., & Sons Co., 5687-97 Butler St., Pgh.
White, L. & I. J., Co., 15 Columbia St., Buffalo, N. Y.

SHEARS
Bliss, E. W., Co., 8 Adams St., Brooklyn, N. Y.
Erie Foundry Co., Erie, Pa.
Garrison, A., Foundry Co., Bingham St., Pgh.
Doelger & Kirsten, Milwaukee, Wis.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
New York Machinery Exchange, Inc., New York City
Quickwork Co., St. Marys, O.
Simmons Machine Co., Inc., Albany, N. Y.
Toledo Machine & Tool Co., Toledo, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

SHEARS (Alligator, automatic)
Doelger & Kirsten, Milwaukee, Wis.

SHEARS (for cutting scrap iron and for special shearing)
Doelger & Kirsten, Milwaukee, Wis.

SHEET BARS
Central Steel Co., The, Massillon, O.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Mudge, Edmund W., & Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.

SHEET METAL STRAIGHTENER
Shuster, The F. B., Co., New Haven, Conn.

SHEET METAL WORK
Bellevue Mfg. Co., Bellevue, Ohio.

SHEET METAL WORKING MACHINERY
Bliss, E. W., Co., 8 Adams St., Brooklyn, N. Y.
Michigan Machine Tool & Foundry Co., Ypsilanti, Mich.
National Roll & Foundry Co., Avonmore, Pa.
Quickwork Co., St. Marys, O.

SHEET ZINC
United Smelting & Aluminum Co., New Haven, Conn.

SHEETS
Allegheny Steel Co., Pittsburgh, Pa.
Amalgamated Products Co., 165 Broadway, N. Y. C.
American Sheet & Tin Plate Co., Pittsburgh, Pa.
Carnahan Tin Plate & Sheet Co., Canton, O.
Central Iron & Steel Co., Harrisburg, Pa.
Ferro Supply Corp., Inc., 41 Union Sq., N. Y. C.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago, Ill.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Mansfield Sheet & Tin Plate Co., Mansfield, O.
Nagle Steel Co., Pottstown, Pa.
Newport Rolling Mill Co., Newport, Ky.
Ryerson, Jos. T., & Son, Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Sharon Steel Hoop Co., Sharon, Pa.
Trumbull Steel Co., Warren, O.
Weirton Steel Co., Weirton, W. Va.
Whitaker-Glessner Co., Wheeling, W. Va.

SHEETS (Automobile)
Allegheny Steel Co., Pittsburgh, Pa.
Mansfield Sheet & Tin Plate Co., Mansfield, O.
Sharon Steel Hoop Co., Sharon, Pa.
Trumbull Steel Co., Warren, O.
Whitaker-Glessner Co., Wheeling, W. Va.

SHEETS (Black)
American Sheet & Tin Plate Co., Pittsburgh, Pa.
Brier Hill Steel Co., Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Carnahan Tin Plate & Sheet Co., Canton, O.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Mansfield Sheet & Tin Plate Co., Mansfield, O.
Newport Rolling Mill Co., Newport, Ky.
Seneca Iron & Steel Co., Buffalo, N. Y.
Sharon Steel Hoop Co., Sharon, Pa.
Wheeling Steel & Iron Co., Wheeling, W. Va.
Whitaker-Glessner Co., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Blue Annealed)
American Sheet & Tin Plate Co., Pittsburgh, Pa.
Brier-Hill Steel Co., Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Newport Rolling Mill Co., Newport, Ky.
Sharon Steel Hoop Co., Sharon, Pa.
Whitaker-Glessner Co., Wheeling, W. Va.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Cold Rolled)
Seneca Iron & Steel Co., Buffalo, N. Y.
Sharon Steel Hoop Co., Sharon, Pa.
Ward's, Edgar T., Sons Co., 54 Farnsworth St., Boston, Mass.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Corrugated)
American Sheet & Tin Plate Co., Pittsburgh, Pa.
Brier Hill Steel Co., Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Newport Rolling Mill Co., Newport, Ky.
Seneca Iron & Steel Co., Buffalo, N. Y.
Trumbull Steel Co., Warren, O.
Whitaker-Glessner Co., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Dead Soft)
American Sheet & Tin Plate Co., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Mansfield Sheet & Tin Plate Co., Mansfield, O.
Newport Rolling Mill Co., Newport, Ky.
Sharon Steel Hoop Co., Sharon, Pa.
Whitaker-Glessner Co., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Deep Stamping)
Sharon Steel Hoop Co., Sharon, Pa.

SHEETS (Deoxidized)
Carnahan Tin Plate & Sheet Co., Canton, O.
Sharon Steel Hoop Co., Sharon, Pa.

SHEETS (Electrical)
Allegheny Steel Co., Pittsburgh, Pa.
American Sheet & Tin Plate Co., Pittsburgh, Pa.
Sharon Steel Hoop Co., Sharon, Pa.

SHEETS (Galvanized)
Allegheny Steel Co., Pittsburgh, Pa.
American Sheet & Tin Plate Co., Pittsburgh, Pa.
Brier Hill Steel Co., Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Newport Rolling Mill Co., Newport, Ky.
Sharon Steel Hoop Co., Sharon, Pa.
Trumbull Steel Co., Warren, O.
Whitaker-Glessner Co., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Nickel)
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.
Newport Rolling Mill Co., Newport, Ky.

SHEETS (Perforated)
Erdle Perforating Co., Rochester, N. Y.

SHEETS (Polished and Planished)
Carnahan Tin Plate & Sheet Co., Canton, O.
Mansfield Sheet & Tin Plate Co., Mansfield, O.

SHEETS (Roofing) (See Roofing and Siding)

SHELVING (Steel)
Edwards Mfg. Co., 401-451 Culvert St., Cincinnati
Empire Art Metal Co., Inc., College Pt., N. Y.

SHIPBUILDERS' EQUIPMENT AND TOOLS
Carpenter, Geo. B., & Co., Dept. 26, Chicago.

SHOP FURNITURE
Western Tool & Mfg. Co., Springfield, O.

SILICON (Ferro)
United States Alloys Corp., 28 E. 42d St., N. Y. C.

SILVER (Boronic All-Metal in Shot Form)
American Boron Products Co., Inc., 636 Court St., Reading, Pa.

SKELP (Open Hearth Basic)
Sharon Steel Hoop Co., Sharon, Pa.

SKIM GATES
Erdle Perforating Co., Rochester, N. Y.

SKIP HOISTS
Bartlett & Snow, C. O., Co., Cleveland, O.

SLABS
American Steel Export Co., New York City
Andrews Steel Co., Newport, Ky.
Donner Steel Co., Inc., Buffalo, N. Y.
Federal Export Corp., 42 Broadway, New York City
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Liberty Steel Products Co., New York City
Mudge, Edmund W., & Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Whitaker-Glessner Co., Wheeling, W. Va.

SLEEVES AND NOZZLES
Rossemer Brick Co., Monongahela, Pa.
Manown Mfg. Co., Pittsburgh, Pa.

SLITTING CUTTERS (Circular)
Tinker, F., & Sons Co., 5687-97 Butler St., Pgh.

SLOTTERS
New York Machinery Exchange, Inc., New York City

SOLDER
United Smelting & Aluminum Co., New Haven, Conn.

SPELTER
United Smelting & Aluminum Co., New Haven, Conn.

SPIEGELEISEN
Bethlehem Steel Co., Bethlehem, Pa.
Marshall, Edward E., Bullitt Bldg., Philadelphia, Pa.

SPIKES
Illinois Steel Co., Chicago, Ill.
Republic Iron & Steel Co., Youngstown, O.

SPOT WELDING
Sciaky Mfg. Co., Brooklyn, N. Y.

SPRING COILING MACHINERY
Bleeper & Hartley, Inc., Worcester, Mass.

SPRINGS
American Vanadium Co., Pittsburgh, Pa.
Barnes, Wallace, Co., 118 South St., Bristol, Conn.
Duer Spring & Mfg. Co., Pittsburgh, Pa.
Fort Pitt Spring & Mfg. Co., Pittsburgh, Pa.
Raymond Mfg. Co., Corry, Pa.

SPRINGS (Coil and Elliptic)
Fort Pitt Spring & Mfg. Co., Pittsburgh, Pa.

SQUEEZER MOLDING MACHINES
Pridmore, Henry E., Chicago, Ill.

SQUEEZERS (Power)
Pridmore, Henry E., Chicago, Ill.

STACKS (Steel)
American Bridge Co., New York City
Lindsay, W. W., Co., Inc., 2 S. 15th St., Philadelphia, Pa.
Phoenix Iron Works Co., Meadville, Pa.

STAMPINGS
Allegheny Steel Co., Pittsburgh, Pa.
American Tube & Stamping Co., Bridgeport, Conn.
Bellevue Mfg. Co., Bellevue, Ohio.
Bettcher Stamping & Mfg. Co., Cleveland, O.
Bossert Corporation, The, Utica, N. Y.
Burr Mfg. Co., The, Cleveland, O.
Crosman Stampings Co., Ypsilanti, Mich.
Empire Art Metal Co., Inc., College Pt., N. Y.
Erdle Perforating Co., Rochester, N. Y.
Fouts, C. C., Co., Middletown, O.
Gler Pressed Steel Co., Lansing, Mich.
Lansing Stamping & Tool Co., Lansing, Mich.
Newark Stamping & Foundry Co., Newark, O.
Perfection Metal Products Co., College Point, N. Y.
Seiss Mfg. Co., Toledo, Ohio.
Standard Tool & Mfg. Co., 70 Lafayette Blvd. E., Detroit, Mich.

STAMPS (Steel)
Pannier Bros. Stamp Co., 207-9 Sandusky St., Pgh.

STAMP HOLDERS (Steel)
Pannier Bros. Stamp Co., 207-9 Sandusky St., Pgh.

STAPLES
Youngstown Sheet & Tube Co., Youngstown, O.

STARTERS (Electric Motor)
Electric Controller & Mfg. Co., Cleveland, O.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

STEAM APPLIANCES
Pgh. Valve, Foundry & Construction Co., Pgh.

STEAM SHOVELS (Second Hand)
Railway & Mine Supply Co., 332 S. Michigan Ave., Chicago, Ill.

STEEL
Aborn Steel Co., Inc., 24 Clarke St., N. Y. C.
American Bridge Co., New York City
American Tube & Stamping Co., Bridgeport, Conn.
Andrews Steel Co., Newport, Ky.
Atlas Crucible Steel Co., Dunkirk, N. Y.
Beals, McCarthy & Rogers, Buffalo, N. Y.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Colonial Steel Co., Keystone Bank Bldg., Pgh.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Federal Export Corp., 42 Broadway, New York City
Ferguson Steel & Iron Co., Buffalo, N. Y.
Ferro Supply Corp., Inc., 41 Union Sq., N. Y. C.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago, Ill.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Interstate Iron & Steel Co., 104 S. Michigan Ave., Chicago, Ill.
Kidd Drawn Steel Co., Aliquippa, Pa.
La Belle Iron Works, Steubenville, O.
Latrobe Electric Steel Co., Latrobe, Pa.
Liberty Steel Products Co., New York City
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Metals Serv. Co., 801 Union Nat. Bk. Bldg., Cleve.
Nagle Steel Co., Pottstown, Pa.
Otis Steel Co., Cleveland, O.
Pacific Coast Steel Co., San Francisco, Cal.
Republic Iron & Steel Co., Youngstown, O.
Stanley Works, The, New Britain, Conn.
Steel Industries Corp., 261 Broadway, N. Y. C.
United Alloys Steel Corp., The, Canton, O.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Ward's, Edgar T., Sons Co., 44 Farnsworth St., Boston, Mass.
Weirton Steel Co., Weirton, W. Va.
West Leechburg Steel Co., Pittsburgh, Pa.
Whitaker-Glessner Co., Wheeling, W. Va.
Wickwire Steel Co., Buffalo, N. Y.

STEEL (Agricultural)
Cambria Steel Co., Philadelphia, Pa.

STEEL (Alloy)
Aborn Steel Co., Inc., 24 Clarke St., N. Y. C.
American Vanadium Co., Pittsburgh, Pa.
Andrews Steel Co., Newport, Ky.
Atlas Crucible Steel Co., Dunkirk, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.
Central Steel Co., The, Massillon, O.
Colonial Steel Co., Keystone Bank Bldg., Pgh.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Crowley, John A., Co., New York City
Hammond Steel Co., Inc., Syracuse, N. Y.
Latrobe Electric Steel Co., Latrobe, Pa.
McConway & Torley Co., Arsenal Station, Pgh.

CASTINGS

AMERICAN STEEL FOUNDRIES

NEW YORK · CHICAGO · PITTSBURGH

STEEL CASTINGS

MILWAUKEE STEEL FOUNDRY CO.
INCORPORATED 1903
HIGH GRADE STEEL CASTINGS
101-121 SOUTH WATER ST.,
MILWAUKEE WISCONSIN

WE MANUFACTURE ONLY THE HIGHEST GRADE
STEEL CASTINGS
RELIANCE STEEL CASTING CO.
28th and Smallman Sts. PITTSBURGH, PA.

ACID OPEN HEARTH STEEL CASTINGS
Castings from 1 lb. to 8000 lbs. each.
In accordance with Army, Navy, Railroad or Lloyd's Specifications.
Also nickel and vanadium steel castings.
ATLANTIC STEEL CASTINGS CO.
Steam and Hydraulic Fittings CHESTER, PA. Ordnance Castings

READING STEEL CASTING COMPANY
STEEL CASTINGS
Reading Steel Casting Co.
READING, PA.

NATIONAL STEEL FOUNDRIES
NSF
OPEN HEARTH STEEL CASTINGS
QUALITY MILWAUKEE SERVICE
NSF

KALAMAZOO MALLEABLE IRON CO.
KALAMAZOO, MICH.

The WEST STEEL CASTING Co.
QUALITY SERVICE
SMALL STEEL CASTINGS
AUTOMOBILE CASTINGS
SAFETY LATHE DOGS
SPECIAL DYNAMO STEEL FOR ELECTRIC CASTINGS
Cleveland
CRUCIBLE CONVERTED
"Watch the West Cast-Steel Wheels go round."

THE DAYTON STEEL FOUNDRY CO.
Quality
HIGH GRADE
STEEL CASTINGS
AUTOMOBILE CASTINGS
A SPECIALTY
Service
DAYTON, OHIO.

Automobile Castings
The Allyne-Ryan Foundry Co.
CLEVELAND

STEEL (Alloy)
(Continued)
National Pressed Steel Co., Massillon, O.
Union Drawn Steel Co., Beaver Falls, Pa.
United Alloys Steel Corp., The, Canton, O.
Union Electric Steel Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

STEEL (Alloy, Stellite)
Haynes Stellite Co., The, Kokomo, Ind.

STEEL (Boronic All-Metal in Shot Form)
American Boron Products Co., Inc., 636 Court St., Reading, Pa.

STEEL (Carbon)
Bethlehem Steel Co., Bethlehem, Pa.
Colonial Steel Co., Keystone Bank Bldg., Pgh.
Ludlum Steel Co., Watervliet, N. Y.

STEEL (Chrome)
Colonial Steel Co., Keystone Bank Bldg., Pgh.

STEEL (Cold Drawn)
Aborn Steel Co., Inc., 24 Clarke St., N. Y. C.
Barnes, Wallace, Co., 118 South St., Bristol, Conn.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Kidd Drawn Steel Co., Aliquippa, Pa.
Latshaw Steel & Metal Products Corp., 261 Broadway, New York City.
Miner-Morse Corp., 15th and Ash Sts., Erie, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Peerless Drawn Steel Co., Massillon, O.
Standard Gauge Steel Co., Beaver Falls, Pa.
Union Drawn Steel Co., Beaver Falls, Pa.
United Alloys Steel Corp., The, Canton, O.
Wellston Steel Co., Wellston, W. Va.
West Leechburg Steel Co., Pittsburgh, Pa.

STEEL (Crucible)
Atlas Crucible Steel Co., Dunkirk, N. Y.
Bethlehem Steel Co., S. Bethlehem, Pa.
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.
Firth-Sterling Steel Co., McKeesport, Pa.
Ludlum Steel Co., The, Watervliet, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.

STEEL (Die)
Atlas Crucible Steel Co., Dunkirk, N. Y.
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Ludlum Steel Co., Watervliet, N. Y.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

STEEL (Electric Furnace)
Allegheny Steel Co., Pittsburgh, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Connecticut Electric Steel Co., Inc., Hartford, Conn.
Crowley, John A., Co., New York City
Firth-Sterling Steel Co., McKeesport, Pa.
Ford, R. M., & Co., Inc., New York City
General Steel Co., Milwaukee, Wis.
Illinois Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Union Electric Steel Co., Pittsburgh, Pa.
United Alloys Steel Corp., The, Canton, O.

STEEL (High Carbon)
Colonial Steel Co., Keystone Bank Bldg., Pgh.

STEEL (High Speed)
Aborn Steel Co., Inc., 24 Clarke St., N. Y. C.
Atlas Crucible Steel Co., Dunkirk, N. Y.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.
Colonial Steel Co., Keystone Bank Bldg., Pgh.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Midvale Steel & Ordnance Co., Philadelphia, Pa.
Onondaga Steel Co., Syracuse, N. Y.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Ward's, Edgar T., Sons Co., 44 Farnsworth St., Boston, Mass.

STEEL (High Speed—Reclaimed)
Onondaga Steel Co., Syracuse, N. Y.

STEEL (High Speed, Stellite)
Haynes Stellite Co., The, Kokomo, Ind.

STEEL (Open-Hearth)
Andrews Steel Co., Newport, Ky.
Braddock Mfg. Co., Braddock, Pa.
Brown-Wales Co., Boston, Mass.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
McConway & Torley Co., Arsenal Station, Pgh.
Mitchell-Tappen Co., New York City
Nagle Steel Co., Pottstown, Pa.
National Pressed Steel Co., Massillon, O.
Penn Seaboard Steel Corp., Franklin Bk. Bldg., Phila.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Union Drawn Steel Co., Beaver Falls, Pa.
Whitaker-Glessner Co., Wheeling, W. Va.

STEEL (Soft)
Bethlehem Steel Co., Bethlehem, Pa.
Miner-Morse Corp., 15th and Ash Sts., Erie, Pa.

STEEL (Spring)
Carnegie Steel Co., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
United Alloys Steel Corp., The, Canton, O.

STEEL (Stainless)
Bethlehem Steel Co., Bethlehem, Pa.

STEEL (Stamping and Drawing)
American Tube & Stamping Co., Bridgeport, Conn.
Sharon Steel Hoop Co., Sharon, Pa.
Stanley Works, The, New Britain, Conn.
Wellston Steel Co., Wellston, W. Va.

STEEL (Strip, Hot and Cold Rolled)
Carnahan Tin Plate & Sheet Co., Canton, O.
Griffin Mfg. Co., The, Erie, Pa.
National Pressed Steel Co., Massillon, O.
Pittsburgh Cold Rolled Steel Co., Verona, Pa.
Stanley Works, The, New Britain, Conn.
Trumbull Steel Co., Warren, O.
Wellston Steel Co., Wellston, W. Va.
West Leechburg Steel Co., Pittsburgh, Pa.

STEEL (Structural)
Alliance Structural Co., Alliance, O.
American Bridge Co., New York City
Amiren Supply Co., Inc., New York City
Bellefontaine Bridge & Steel Co., The, Bellefontaine, O.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Blaw-Knox Co., 602 Farmers Bank Bldg., Pgh.
Bourne-Fuller Co., The, Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Case Crane & Engineering Co., Columbus, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Empire Art Metal Co., Inc., College Pt., N. Y.
Ferguson Steel & Iron Co., Buffalo, N. Y.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago, Ill.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Kratzer, W. N., Co., 3212 Small St., Pgh.
Lackawanna Steel Co., Buffalo, N. Y.
Lindsay, W. W., Co., Inc., 2 S. 15th St., Phila.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
McClintic-Marshall Co., Pittsburgh, Pa.
Phoenix Iron Co., 410 Walnut St., Philadelphia, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Republic Structural Iron Works, Inc., Cleveland, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Suite 1127 New Continental and Commercial Bank Bldg., Chicago, Ill.
Shippers' Car Line, New York City
Snead Architectural Iron Works, Louisville, Ky.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.
Whitaker-Glessner Co., Wheeling, W. Va.

STEEL (Tool)
Aborn Steel Co., Inc., 24 Clarke St., N. Y. C.
American Steel Export Co., New York City
Atlas Crucible Steel Co., Dunkirk, N. Y.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.
Carnegie Steel Co., Pittsburgh, Pa.
Colonial Steel Co., Keystone Bank Bldg., Pgh.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Hammond Steel Co., Inc., Syracuse, N. Y.
Latrobe Electric Steel Co., Latrobe, Pa.
Metals Serv. Co., 801 Union Nat. Bk. Bldg., Clevd.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
United Alloy Steel Corporation, Canton, O.
Ward's, Edgar T., Sons Co., 44 Farnsworth St., Boston, Mass.

STEEL (Tool, Stellite)
Haynes Stellite Co., The, Kokomo, Ind.

STEEL PLANT CONSTRUCTION
Lindsay, W. W., Co., Inc., 2 S. 15th St., Phila.

STEEL PLATE CONSTRUCTION
Blaw-Knox Co., 602 Farmers Bank Bldg., Pgh.
Colonial Iron Works Co., Cleveland, O.
Erie City Iron Works, Erie, Pa.
Pennsylvania Engrg. Works, New Castle, Pa.

STEEL STAMPINGS
American Tube & Stamping Co., Bridgeport, Conn.
Griffin Mfg. Co., Erie, Pa.
Kempsmith Mfg. Co., Milwaukee, Wis.

STELLITE
Haynes Stellite Co., The, Kokomo, Ind.

STOKERS
Babcock & Wilcox Co., The, New York City
Combustion Engineering Corp., 11 Broadway, N. Y. C.
Erie Foundry Co., Erie, Pa.
Green Engineering Co., E. Chicago, Ind.
Hagan, Geo. J., Co., Pittsburgh, Pa.

STOOLS (Metal)
Royal Metal Mfg. Co., S. Western Ave., Chicago.

STRAIGHTENING MACHINERY
Abramsen Engineering Co., Pittsburgh, Pa.
Shuster, The F. B., Co., New Haven, Conn.

STRAPS (Connecting)
Bay City Forge Co., Erie, Pa.
Camden Forge Co., Camden, N. J.

STRIP STEEL STRAIGHTENERS
Shuster, The F. B., Co., New Haven, Conn.

STUDS (Milled)
Ferry Cap & Set Screw Co., 2151 Scranton Rd., Cleveland, O.

SULPHURIC ACID
Cleveland-Cliffs Iron Co., Cleveland, O.

SUPPLIES AND ACCESSORIES (Sand Blast)
Pangborn Corporation, Hagerstown, Md.

SWITCHES (Electric)
Electric Controller & Mfg. Co., Cleveland, O.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

SWITCH STANDS
Bethlehem Steel Co., The, So. Bethlehem, Pa.

SYNDOLAG
Davison, Allen S., Co., Pittsburgh, Pa.

TABLE SAND BLASTS
Pangborn Corporation, Hagerstown, Md.

TACHOMETERS
Brown Instrument Co., Philadelphia, Pa.

TACKS
Interstate Iron & Steel Co., 104 S. Michigan Ave., Chicago, Ill.

TANK CARS
Shippers Car Line, New York City

TANKS (Acetylene)
Linde Air Products Co., New York City
National Tube Co., Pittsburgh, Pa.

TANKS (Steel and Wood)
Air Tight Steel Tank Co., Pittsburgh, Pa.
American Bridge Co., New York City
Caldwell, W. E., Co., 2350 Brook St., Louisville, Ky.
Farrar & Trefts, Buffalo, N. Y.
Hauser-Stander Tank Co., Cincinnati, O.
Morgan Construction Co., Worcester, Mass.
National Products Co., East Liverpool, O.
National Tube Co., Pittsburgh, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Producers Supply Co., Franklin, Pa.
Shippers Car Line, New York City

TAPPING MACHINES
Cleveland Power Transmission Co., Cleveland, O.
Detroit Reamer & Tool Co., Detroit, Mich.
New York Machinery Exchange, Inc., New York City
Rickert-Shafer Co., 612 W. 12th St., Erie, Pa.

TAPS (Hand and Machine)
Jaeger, M., 342 Engineers Bldg., Cleveland, O.

TAR EXTRACTORS
Smith Gas Engrg. Co., The, Dayton, O.

TEMPERATURE INSTRUMENTS
Taylor Instrument Companies, Rochester, N. Y.

TEMPLET LUMBER
Johnson, Thomas V., Inc., 1532 1st Nat. Bk. Bldg., Milwaukee.

THERMOMETERS
Brown Instrument Co., Philadelphia, Pa.
Taylor Instrument Companies, Rochester, N. Y.

THREAD CUTTING TOOLS
Landis Machine Co., Waynesboro, Pa.

TIE PLATES
Bethlehem Steel Co., Bethlehem, Pa.
Inland Steel Co., Chicago, Ill.

TIERING MACHINES
N. Y. Revolving Portable Elevator Co., 391 Garfield Ave., Jersey City, N. J.
Revolvator Co., 391 Garfield Ave., Jersey City, N. J.

TIES (Creosoted Wood)
Jennison-Wright Co., 2485 Broadway, Toledo, O.
Republic Creosoting Co., Indianapolis, Ind.
Rodd Co., The, Century Bldg., Pittsburgh, Pa.

TIES (Steel Mine)
Cambria Steel Co., Philadelphia, Pa.

TILE (Fire Clay)
Union Mining Co., Mt. Savage, Md.

TIN
United Smelting & Al. Co., New Haven, Conn.

TINNED WIRE (Equipment)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

TIN PLATE
American Sheet & Tin Plate Co., Pittsburgh, Pa.
American Steel Co., Pittsburgh, Pa.
American Steel Export Co., New York City
Bethlehem Steel Co., Bethlehem, Pa.
Carnahan Tin Plate & Sheet Co., Canton, O.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Liberty Steel Co., The, Warren, O.
Merchant & Evans Co., Philadelphia, Pa.
Standard Tin Plate Co., Canonsburg, Pa.
Taylor, N. & G., Co., Inc., 300 Chestnut St., Phila.
Trumbull Steel Co., The, Warren, O.
Wheeling Steel & Iron Co., Wheeling, W. Va.
Wellston Steel Co., Wellston, W. Va.

TIN PLATE MILL EQUIPMENT
Birdsboro Steel Fdy. & Machine Co., Birdsboro, Pa.
National Roll & Fdy. Co., Avonmore, Pa.
Treadwell Engineering Co., Easton, Pa.
United Eng. & Fdy. Co., Pittsburgh, Pa.

TIRES (Locomotive and Car Wheel)
Midvale Steel & Ordnance Co., Philadelphia, Pa.

TITANIUM
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

TOOL BITS (High Speed)
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.
Onondaga Steel Co., Syracuse, N. Y.

TOOL HOLDER BITS (Treated)
Bethlehem Steel Co., Bethlehem, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

TOOL HOLDERS
Gisholt Machine Co., Madison, Wis.
Western Tool & Mfg. Co., Springfield, O.
Williams, J. H., & Co., 58 Richards St., Brooklyn, N. Y.

TOOL STEEL (High Speed)
Aborn Steel Co., Inc., 24 Clarke St., N. Y. C.
Bethlehem Steel Co., Bethlehem, Pa.
Colonial Steel Co., Keystone Bank Bldg., Pgh.
Midvale Steel & Ordnance Co., Philadelphia, Pa.
Onondaga Steel Co., Syracuse, N. Y.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.

TOOLS
Cleveland Pneumatic Tool Co., Cleveland, O.
Cleveland Power Transmission Co., Cleveland, O.
Crosman Stamping Co., Ypsilanti, Mich.
Detroit Reamer & Tool Co., Detroit, Mich.
Haynes Stellite Co., The, Kokomo, Ind.
Lansing Stamping & Tool Co., Lansing, Mich.
Oldham, Geo., & Sons Co., Frankford, Phila.
Ryerson, Jos. T., & Son, Chicago, Ill.
Standard Tool & Mfg. Co., 70 Lafayette Blvd. E., Detroit, Mich.
White, L. & I. J., Co., 15 Columbia St., Buffalo, N. Y.
Williams, A. R., Machinery & Supply Corp., Fidelity Bldg., Buffalo, N. Y.

TOOLS (Special)
Cleveland Power Transmission Co., Cleveland, O.
Detroit Reamer & Tool Co., Detroit, Mich.
National Tool Co., Cleveland, Ohio.

CASTINGS

LIGHT
STEEL CASTINGS
for

Trucks
Tractors
Dredges
Bridges
Mine Cars
Mining Machinery
Industrial Cars
Wood-working Machinery
Iron-working Machinery
Etc., Etc., Etc.

Our castings are clean, smooth, and easily machined. Deliveries prompt.

Send blue prints and state quantities, for quotation.

Reed Foundry & Machine Co.
Kalamazoo, Mich.

ELECTRIC FURNACE STEEL CASTINGS
FOR ALL PURPOSES
MAYNARD ELECTRIC STEEL CASTINGS COMPANY
MILWAUKEE, WISCONSIN

HIGH GRADE SMALL
ELECTRIC STEEL CASTINGS
Also
Chrome, Nickel and Vanadium Alloy Steel Castings
The Crucible Steel Casting Co.
CLEVELAND, O.

STEEL CASTINGS
Electric Furnace and Converter
Bayonne Steel Casting Co.
BAYONNE, N. J.

Electric Steel Castings
of Highest Quality
Heroult Electric Furnace and New Modern Plant
Inquiries Invited
The Connecticut Electric Steel Co., Inc. -:- Hartford, Conn.

CASTINGS
High grade Malleable and Electric Steel castings. Quality, finish and service assured.
ACME STEEL & MALLEABLE IRON WORKS, INC.
BUFFALO, N. Y.

TORCHES (Acetylene, Blow, Oxy-Acetylene)
Davis-Bournonville Co., Jersey City, N. J.
Linde Air Products Co., New York City
Oxweld Acetylene Co., Chicago, Ill.

TORCHES (Foundry)
Mahr Mfg. Co., Minneapolis, Minn.

TOTE BOXES (Nesting and Stacking)
New Britain Machine Co., New Britain, Conn.

TRACK AND RAIL SUPPLIES
American Steel Export Co., New York City
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Chase Foundry & Mfg. Co., Columbus, O.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago, Ill.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., The, Chicago, Ill.
Lackawanna Steel Co., Buffalo, N. Y.

TRACK (Industrial)
Lakewood Engineering Co., Cleveland, O.

TRACKS (Portable)
Lakewood Engineering Co., Cleveland, O.

TRACTORS (Storage Battery)
Lakewood Engineering Co., Cleveland, O.

TRAILERS (Factory and Warehouse)
Lakewood Engineering Co., Cleveland, O.

TRAMRAILS (Overhead Systems)
Whiting Foundry Equipment Co., Harvey, Ill.

TRAMWAYS
Link-Belt Company, Chicago, Ill.

TRAMWAYS (Wire Rope)
Macomber & Whyte Rope Co., Kenosha, Wis.

TRANSFORMERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

TRANSMISSION CHAINS
Link-Belt Company, Chicago, Ill.

TRANSMISSION TOWERS
Blaw-Knox Co., 602 Farmers Bank Bldg., Pgh.

TROLLEYS
Cleveland Crane & Engrg. Co., Wickliffe, O.
Lakeside Bridge & Steel Co.,
123 Villard Ave., N. Milwaukee, Wis.
Shepard El. Crane & Hoist Co., Montour Falls, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.

TROLLEY AND TRACK EQUIPMENT
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

TRUCKS (Factory and Foundry)
Abell-Howe Co., McCormick Bldg., Chicago.
Koppel Industrial Car & Equip. Co., Koppel, Pa.
Lakewood Engineering Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

TRUCKS (Industrial)
Atlas Car & Mfg. Co., Dept. E., Cleveland, O.

TRUCKS (Motor)
Federal Motor Truck Co., Detroit, Mich.

TRUCKS (Storage Battery)
Lakewood Engineering Co., Cleveland, O.

TRUCKS (Wire Mill)
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

TUBE MILL MACHINERY
Standard Engrg. Co., Ellwood City, Pa.

TUBES
Allegheny Steel Co., The, Pittsburgh, Pa.
American Steel Export Co., New York City
Empire Art Metal Co., Inc., College Pt., N. Y.
La Belle Iron Works, Steubenville, O.
Midvale Steel & Ordnance Co., Philadelphia, Pa.
National Tube Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Steel Industries Corp., 261 Broadway, N. Y. C.
Toledo Steel Tube Co., Toledo, O.
Warner Forge Co., 3928 E. 105th St., Chicago.
Wheeling Steel & Iron Co., Wheeling, W. Va.
Worth Brothers Co., Philadelphia, Pa.

TUBES (Cold Drawn Seamless Steel)
Detroit Seamless Steel Tube Co., Detroit, Mich.
Latshaw Steel & Metal Products Corp.,
261 Broadway, New York City.
National Tube Co., Pittsburgh, Pa.
Rome Metal Prod. Co., Inc., 37 Nassau St., N. Y. C.
Ward's, Edgar T., Sons Co., 54 Farnsworth St.,
Boston, Mass.

TUBES (Forged Steel)
Warner Forge Co., 3928 E. 105th St., Chicago.

TUBING
Perfection Metal Products Co., College Point, N. Y.

TUBS (Wire Mill Cleaning House)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

TUMBLING MILLS
Whiting Fdy. Equipment Co., Harvey, Ill.

TURBINES (Steam)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

TURNBUCKLES
American Bridge Co., New York City
Merrill Brothers, Maspeth, N. Y.
Michigan Bolt & Nut Works, Detroit, Mich.
Republic Iron & Steel Co., Youngstown, O.
Russell, Burdsall & Ward Bolt & Nut Co.,
Port Chester, N. Y.

TURNING (Steel)
Bidle, W. S., Co., 1411 E. 45th St., Cleveland, O.

TURNTABLES
American Bridge Co., New York City
Atlas Car & Mfg. Co., Dept. E, Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Koppel Industrial Car & Equip. Co., Koppel, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

UNION COUPLINGS (Cold Drawn Steel)
Mark Mfg. Co., 1907 Dempster St., Evanston, Ill.

UNIONS (Pipe)
Dart, E. M., Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Mark Mfg. Co., 1907 Dempster St., Evanston, Ill.

USED AND REBUILT EQUIPMENT
American Machy. Exchange, New York City
Bennett, G. L., Machinery Co., Inc., N. Y. C.
Biggs-Watterson Co., Cleveland, O.
Calleson, C. A., New York City
Castle & Wilson, Pittsburgh, Pa.
Davis, J. F., Chicago, Ill.
Dotterweich, A. J., Co., Inc., Buffalo, N. Y.
Duplex Machinery Co.,
532 Leader News Bldg., Cleveland, O.
Duquesne Electric & Mfg. Co., Pittsburgh, Pa.
Graves Machinery Exchange, New York City
Green, L. A., Pittsburgh, Pa.
Harris Brothers Co., Chicago, Ill.
McCoy-Brandt Machinery Co., 210 Penn Ave., Pgh.
MacGovern & Co., Inc., New York City
Mitchell-Tappen Co., New York City
Modern Machinery Exchange, New York City
National Products Co., East Liverpool, O.
New Jersey Machinery Exchange, Newark, N. J.
New York Machy. Exchange, New York City
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Parsons, Henry T., Pittsburgh, Pa.
Pettler, P., & Son, Beaver Falls, Pa.
Potts, Henry, & Co., Philadelphia, Pa.
Power Equipment Co., Philadelphia, Pa.
Railway & Power Equipment Co., New York City.
Riverside Machy. Depot, Detroit, Mich.
Russell Machine Co., Pittsburgh, Pa.
Schoonmaker, A. G., & Sons, New York City
Scully-Jones Co., Chicago, Ill.
Simmons Machine Co., Inc., Albany, N. Y.
Titan Equipment Co., New York City.
Toomey, Frank, Inc., Philadelphia, Pa.
Wayne Machinery Co., Fort Wayne, Ind.
Wickes Machinery Co., Jersey City, N. J.

VALVE LEATHERS
Graton & Knight Mfg. Co., Worcester, Mass.

VALVES (Gas and Air Reversing)
Pgh. Valve, Foundry & Construction Co., Pgh.
Wellman-Seaver-Morgan Co., Cleveland, O.

VALVES AND FITTINGS
Amalgamated Products Co., 165 Broadway, N. Y. C.
Blair Engineering Co., 17 Battery Pl., N. Y. C.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Supply Co., Pittsburgh, Pa.
Connersville Blower Co., The, Connersville, Ind.
Dayton Steel Foundry Co., Dayton, O.
Homestead Valve Mfg. Co., Pittsburgh, Pa.
Lunkenheimer Co., The, Cincinnati, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Pgh. Valve, Foundry & Construction Co., Pgh., Pa.
Powell, Wm., Co., 1200 Draper St., Cincinnati, O.

VANADIUM
American Vanadium Co., Pittsburgh, Pa.

VENTILATING SYSTEMS
Buckeye Blower Co., Columbus, O.
Merchant & Evans Co., Philadelphia, Pa.

VISES
Columbian Hardware Co., Cleveland, O.
Williams, J. H., & Co.,
52 Richards St., Brooklyn, N. Y.

WASHED METAL
Brier Hill Steel Co., Youngstown, O.

WASHER CUTTING MACHINES
Southwark Foundry & Mach. Co., Philadelphia, Pa.

WASHERS (Iron and Steel)
Allegheny Steel Co., Pittsburgh, Pa.
Bayonne Bolt & Nut Co., Bayonne, N. J.
Bethlehem Steel Co., Bethlehem, Pa.
Bettcher Stamping & Mfg. Co., Cleveland, O.
Griffin Mfg. Co., Erie, Pa.
Milton Mfg. Co., Milton, Pa.
Russell, Burdsall & Ward Bolt & Nut Co.,
Port Chester, N. Y.
Wrought Washer Mfg. Co., Milwaukee, Wis.

WASHERS (Leather)
Graton & Knight Mfg. Co., The, Worcester, Mass.

WASHING MATERIAL (Rags)
Ford, J. B., Co., Wyandotte, Mich.

WATER CINDER MILLS
Whiting Foundry Equipment Co., Harvey, Ill.

WATER COOLED STANDING (For Sheet and Tin Mills)
National Roll & Foundry Co., Avonmore, Pa.

WATER TOWERS (Steel)
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.

WELDED PRODUCTS (Electric)
Perfection Metal Products Co., College Point, N. Y.
Standard Screw Products Co., Detroit, Mich.

WELDED STEEL PLATE CONSTRUCTION
Blaw-Knox Co., 602 Farmers Bank Bldg., Pgh., Pa.

WELDING AND CUTTING (Oxy-Acetylene)
Davis-Bournonville Co., Jersey City, N. J.
Fouts, C. C., Company, Middletown, O.
Linde Air Products Co., New York City
Modern Engrg. Co., St. Louis, Mo.
Oxweld Acetylene Co., Chicago, Ill.

WELDING AND CUTTING APPARATUS (Electric)
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

WELDING AND CUTTING APPARATUS (Oxy-Acetylene)
Air Reduction Co., 120 Broadway, New York City.
Davis-Bournonville Co., Jersey City, N. J.
Linde Air Products Co., New York City
Modern Engrg. Co., St. Louis, Mo.
Oxweld Acetylene Co., Chicago, Ill.

WELDING AND CUTTING SUPPLIES
Air Reduction Co., 120 Broadway, New York City.
Davis-Bournonville Co., Jersey City, N. J.
Linde Air Products Co., New York City
Oxweld Acetylene Co., Newark, N. J.

WELDING RODS
Page Steel & Wire Co., 30 Church St., N. Y. C.
Pittsburgh Steel Co., Pittsburgh, Pa.

WHEELS (Car and Locomotive)
American Steel Export Co., New York City
American Steel Foundries, Chicago, Ill.
Carnegie Steel Co., Pittsburgh, Pa.
Farrell-Cheek Steel Foundry Co., Sandusky, O.
Koppel Industrial Car & Equip. Co., Koppel, Pa.
Pittsburgh Iron & Steel Foundries Co., Pgh., Pa.

WHEELS (Rolled Steel)
Cambria Steel Co., Philadelphia, Pa.

WHEELS (Rope)
Cooper, C. & G., Co., Mt. Vernon, O.

WHEELS (Steel Truck)
Dayton Steel Foundry Co., Dayton, O.
Farrell-Cheek Steel Foundry Co., Sandusky, O.

WINDERS, LINK (Coil Chain)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

WIRE (Barb)
Pittsburgh Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE (Copper Clad Steel)
Page Steel & Wire Co., 30 Church St., N. Y. C.

WIRE (Ignition)
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.

WIRE (Lath)
Wright Wire Co., Worcester, Mass.

WIRE (Piano and Music)
Aborn Steel Co., Inc., 24 Clarke St., N. Y. C.
Boker, H., & Co., Inc., 101 Duane St., N. Y. C.
Waterbury Company, 63 Park Row, New York City

WIRE (Steel)
Page Steel & Wire Co., 30 Church St., N. Y. C.

WIRE (Threaded)
Progressive Mfg. Co., Torrington, Conn.

WIRE (Welding)—See WELDING RODS

WIRE CLOTH
Wright Wire Co., Worcester, Mass.

WIRE COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE FENCE
Knapp Fence Co., Cleveland, Ohio.
Pittsburgh Steel Co., Pittsburgh, Pa.
Wright Wire Co., Worcester, Mass.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE GRILLS (Window, Machinery, Tool Room)
Wright Wire Co., Worcester, Mass.

WIRE GUARDS
Wright Wire Co., Worcester, Mass.

WIRE MILL MACHINERY
Blake & Johnson Co., Waterbury, Conn.
Kilby Mfg. Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., New Haven, Conn.
Torrington Mfg. Co., Torrington, Conn.

WIRE MILL MACHINERY (Equipment Complete)
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

WIRE NAIL MACHINERY (Equipment Complete)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

WIRE ROPE AND FITTINGS
American Steel & Wire Co., Chicago, Ill.
Macomber & Whyte Rope Co., Kenosha, Wis.
Roebling's, Sons Co., John A., Trenton, N. J.
Waterbury Company, 63 Park Row, New York City
Williamsport Wire Rope Co., Williamsport, Pa.
Wright Wire Co., Worcester, Mass.

WIRE STRAIGHTENING AND CUTTING MACHINES
Shuster, The F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE, WIRE RODS AND WIRE PRODUCTS
Amalgamated Products Co., 165 Broadway, N. Y. C.
American Steel & Wire Co., Chicago, Ill.
Cambria Steel Co., Philadelphia, Pa.
Ferro Supply Corp., Inc., 41 Union Sq., N. Y. C.
Interstate Iron & Steel Co.,
104 S. Michigan Ave., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Wickwire Steel Co., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WOOD BLOCKS (Creosoted)
Jennison-Wright Co., 2485 Broadway, Toledo, Ohio.
Republic Creosoting Co., Indianapolis, Ind.
Rodd Co., The, Century Bldg., Pittsburgh, Pa.

WORK STANDS (Portable)
New Britain Machine Co., New Britain, Conn.

WRENCHES
Camden Forge Co., Camden, N. J.
Lakeside Forge Co., Erie, Pa.
Lowell Wrench Co., Worcester, Mass.
Williams, J. H., & Co.,
52 Richards St., Brooklyn, N. Y.

WRENCHES (Pipe)
Drop Forging Co. of N. Y., Jersey City, N. J.
Williams, J. H., & Co.,
52 Richards St., Brooklyn, N. Y.

CASTINGS

Penn Seaboard Steel Corporation

FRANKLIN BANK BUILDING
PHILADELPHIA, PA.

Steel Castings, Stockless Anchors, Steel Plate, Forging Ingots

Works
Penn Works, Chester, Pa.
Baldt Works, New Castle, Del.
New Haven Works, New Haven, Conn.

GRAY IRON AND SEMI-STEEL
CASTINGS
LIGHT, MEDIUM AND HEAVY
Modern Equipment Assures Prompt Delivery
THE BOWLER FOUNDRY CO. Cleveland
Office 1692 COLUMBUS RD.

The Aetna Steel Castings Co.
Cleveland, Ohio
CONVERTER STEEL CASTINGS
1 lb. to 1000 lbs.

TISCO MANGANESE STEEL CASTINGS
FOR SEVERE SERVICE
Taylor-Wharton Iron & Steel Co.
High Bridge, New Jersey

BRASS and BRONZE CASTINGS
We specialize in
BUSHINGS and BEARINGS
Attractive proposition on orders for 200 or more bushings from same pattern.
Large Capacity—Molding Machine Equipment
PROMPT SERVICE
THE RYDER BRASS FOUNDRY CO.
BUCYRUS, O.
Pittsburgh Office: 518 Ferguson Bldg.

ROLLING MILL CASTINGS
Let us quote on your requirements
CYCLOPS FOUNDRY CO.
BELL PHONE COURT 2725
PITTSBURGH, PA.

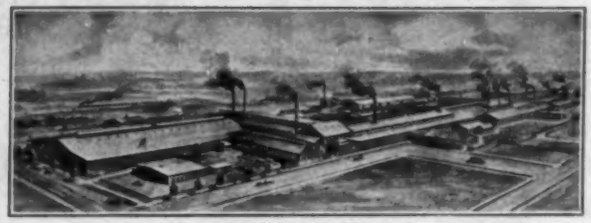
CASTINGS

OWOSSO, MICHIGAN

American Malleables Co.

General Offices
Lancaster, New York
(Suburb of Buffalo)

Malleable Iron Castings



LANCASTER, NEW YORK

MISSOURI MALLEABLE IRON CO.

Highest Grade Malleable Iron Castings

Capacity 25,000 Tons Per Annum **EAST ST. LOUIS, ILL.**

THE MARION MALLEABLE IRON WORKS

MARION, INDIANA

MALLEABLE CASTINGS

For General Purposes

MALLEABLE IRON CASTINGS

VERMILION MALLEABLE IRON CO.
HOOPESTON, ILLINOIS

De-Oxidized Semi-Malleable Refined Iron

40000 lbs. to 50,000 lbs. tensile strength

Garden City Foundry Co.
3174-76 Archer Av.
Chicago

also Grey Iron Castings

Malleable Iron Castings

Quality and Service

The Danville Malleable Iron Company

DANVILLE, ILLINOIS

HIGH GRADE MALLEABLES

Malleable Iron Castings of every description. True to pattern—free from blemishes, scale or shrinkage cracks. Made to specified tensile or transverse strength tests. ¶ We are in a position to furnish you castings from your blue prints. Let us figure on your requirements.

We are serving many of the most prominent manufacturing industries in these United States to their entire satisfaction. Let us add you to the list.

THE MAL-GRA CASTINGS CO.

CAMBRIDGE CITY, IND.

Belle City Malleable Iron Castings

Trucks and Freight Cars

are more dependable and give longer service if their malleable iron castings are "BELLE CITY" quality

The back-bone of an army is its line of transportation. Successful operations depend upon the ability of the motor trucks and railroads to bring up supplies and ammunition.

Faultily constructed conveyors, whether "over there" or "over here" will cause serious delays in the transportation system of our army.

You can do your share toward keeping up an uninterrupted flow of supplies to "our boys" by using only dependable castings in the construction of your Trucks or Freight Cars.

Belle City Malleable Iron Castings have always been dependable and of uniform quality.

Let us figure on your next order.

Belle City Malleable Iron Company

Racine, Wisconsin

CASTINGS

PITTSBURGH MALLEABLE IRON CO.

MALLEABLE CASTINGS

Pittsburgh, Penna.

ZANESVILLE MALLEABLE CO.

MALLEABLE CASTINGS

ZANESVILLE, OHIO

MALLEABLE IRON

CASTINGS

The American Malleable Castings Co.

MARION, OHIO

DECATUR

MALLEABLE IRON COMPANY

DECATUR ILLINOIS

MALLEABLE IRON CASTINGS

PEORIA MALLEABLE CASTINGS COMPANY

The factory of service

High Grade Malleables of all descriptions

PEORIA, ILL., U. S. A.

MODERN EQUIPMENT LARGE CAPACITY

HAMMOND

Malleable Iron Co.

Capacity 20,000 tons per annum

Hammond, Indiana

ERIE MALLEABLE IRON COMPANY

ERIE, PA.

Richmond Malleable Castings Co.

Richmond, Indiana

MALLEABLE CASTINGS

OF QUALITY

ST. LOUIS MALLEABLE CASTING CO.

ST. LOUIS, MO.

High Grade Malleable and Gray Iron Castings

Prompt Delivery

LAKESIDE MALLEABLE CASTINGS COMPANY. RACINE, WIS.

QUALITY

REFINED AIR FURNACE MALLEABLE CASTINGS

SERVICE

CASTINGS

Malleable Iron *Gray Iron*

CASTINGS

from customers' patterns

Illinois Malleable Iron Co.
Chicago, Ill.

Manufacturers of Cast Iron and Malleable Iron Fittings, screwed and flanged.

MALLEABLE CASTINGS

We positively guarantee Quality and Deliveries
THE COLUMBUS MALLEABLE IRON CO.
COLUMBUS, OHIO

CASTINGS
FINE LIGHT GRAY IRON
North Buffalo Hardware Foundry
BUFFALO, N. Y.

HEAVY IRON CASTINGS

OUR 54 YEARS EXPERIENCE COUPLED WITH MODERN EQUIPMENT ASSURE YOU PROMPT DELIVERY OF GREY IRON CASTINGS SEMI-STEEL CASTINGS SINGLE CASTINGS TO 40 TONS

FARRAR & TREFTS INC.
ENGINEERS, FOUNDERS, MACHINISTS, BOILER MAKERS, TANK BUILDERS, PATTERN MAKERS
BUFFALO, N.Y.

GRAY IRON CASTINGS

We have surplus capacity and can furnish medium machine castings up to 25,000 pounds. Our castings are above the average; our supply of pig iron abundant. Send us your specifications.

CRAWFORD & McCRIMMON CO. - Brazil, Ind.

Dayton Malleable Iron Co.
Dayton, Ohio

MALLEABLE IRON CASTINGS
OF ALL DESCRIPTIONS
MADE BY
STANDARD MALLEABLE IRON CO.
MUSKEGON, MICHIGAN
ESTABLISHED 1896

GREY IRON OR SEMI-STEEL CASTINGS

Up to 60 Tons **Prompt Deliveries**
THE CITY FOUNDRY COMPANY - - - Cleveland, Ohio

CASTINGS

GRAY IRON CASTINGS
ANY SIZE FROM TEN POUNDS TO TWENTY TONS
F. R. PATCH MFG. CO., RUTLAND, VERMONT

GRAY IRON **CASTINGS** SEMI-STEEL
5 Pounds to 5 Tons
Molding Machine Equipment
"Valveless" Gas Engines
Steel Storage Tanks
Commercial Forgings
PRODUCERS SUPPLY CO.
Franklin, Penn'a.

GREY IRON CASTINGS
10 POUNDS TO 5 TONS EACH
SEND US YOUR PATTERNS
PROMPT SERVICE REASONABLE PRICES
EXCELSIOR TOOL & MACHINE CO.
EAST ST. LOUIS, ILL.

The Marshall Foundry Company
Pittsburgh, Pa.
Ingot Molds Gray Iron Castings
Capacity 1000 Tons per day

GRAY IRON, BRASS AND BRONZE CASTINGS
Machine and Forging Departments, General Manufacturers. We are desirous of securing long time contracts on castings only, or machining of same as well.
THE McKINNON IRON WORKS COMPANY Ashtabula, Ohio

IMMEDIATE DELIVERY
GRAY IRON CASTINGS
5 pounds to 10 tons
Send us your inquiries
ALLEGHENY FOUNDRY & MACHINE CO.
Glassmere, Pa. (Pittsburgh District)

HIGH GRADE
Malleable Iron Castings
PROMPT DELIVERY
THE LANCASTER FOUNDRY CO.
Lancaster, Pa.

THE QUALITY THAT LASTS
Rolling Mill and Blast Furnace castings to withstand long hard service should be—
KEYSTONE
QUALITY CASTINGS
from Brass, Bronze, Copper or Aluminum
We are also manufacturers of
Blast Furnace Tuyeres, Coolers and Bosh Plates
Babbitt Metals
True Alloys of virgin metals, properly compounded
KEYSTONE BRONZE COMPANY
Gen. Offices, 39th St., Pittsburgh, Pa.

CENTRE FOUNDRY & MACHINE CO.
WHEELING, W. VA.
GRAY IRON CASTINGS
For BLAST FURNACES, OPEN HEARTHS, ROLLING MILLS, TIN MILLS
BUILDERS OF SPECIAL MACHINERY

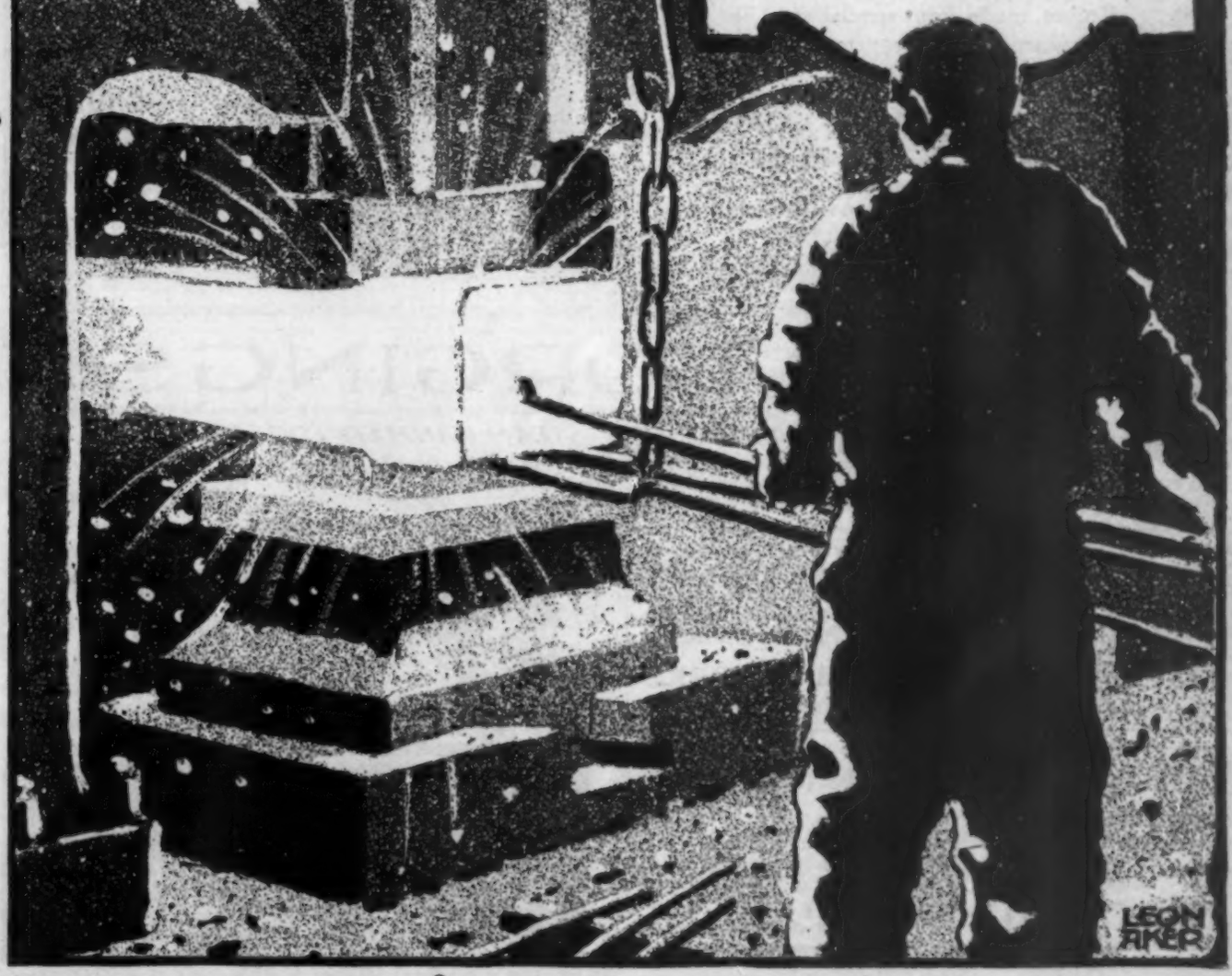
TIOGA FORGINGS

Anything that can be Forged is "meat" for us. But of course variable conditions enable us at times to give especially prompt service in some special line. We're interested in your proposition—and you'll be interested in ours—no matter what it is you want forged, but right NOW it will pay you particularly well to get our estimates on your ***Heavy Press and Hammer Forgings—Rough or Finished Machined—Solid or Bored. WRITE or WIRE.***

"If it's FORGINGS—Tell TIOGA"

Tioga Steel & Iron Co.
Philadelphia, Pa.

Subsidiary of Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Other Plants: Philadelphia Roll & Machine Co., Philadelphia, Pa. Wm. Wharton, Jr., & Co., Inc., Easton, Pa.



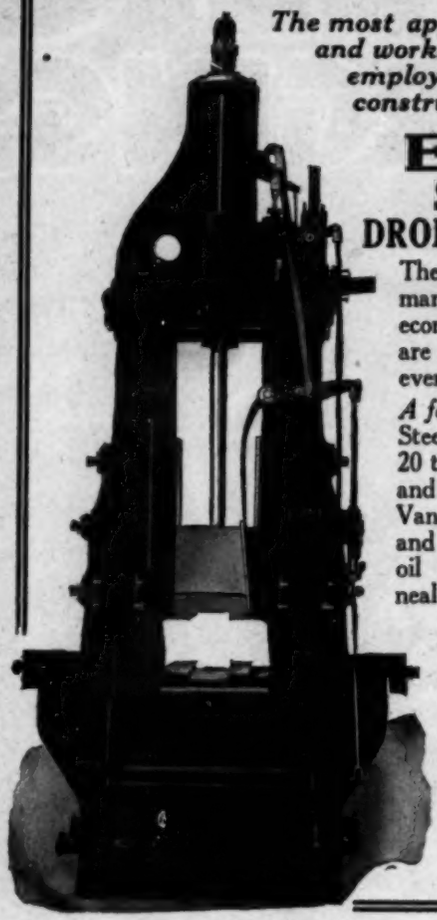
FORGINGS

TRADE MARK H TRADE MARK H

HIGH GRADE FORGINGS

Die Blocks, Piston Rods and Shear Knives, made from special steel for each purpose, and heat treated by an experienced organization.

HEPPENSTALL FORGE & KNIFE CO.
Pittsburgh, - Pennsylvania
DISTRICT OFFICES
St. Louis Detroit Philadelphia Bridgeport, Conn.
Chicago Cleveland New York San Francisco



The most approved material and workmanship are employed in the construction of

ERIE STEAM DROP HAMMERS

They are built for many years of efficient economical service, and are strictly modern in every respect.

A few interesting facts: Steel Anvils in ratio of 20 to 1. Steel Frames and Tie Plates; Chrome Vanadium Steel Piston and Rod forged solid, oil treated and annealed.

Full details?

ERIE FOUNDRY COMPANY
ERIE, PENNA. U. S. A.

DROP FORGINGS

DROP, HEADING MACHINE AND STEAM HAMMER FORGINGS

THE CHAMPION MACHINE AND FORGING COMPANY, CLEVELAND, O., Sixth City
NEW YORK OFFICE, 30 CHURCH ST. CHICAGO OFFICE, RAILWAY EXCHANGE BLDG. PHILADELPHIA OFFICE, BOURSE BLDG. DETROIT, H.B.KENDAL 56 CADILLAC SQ.

FORGINGS

Shafting Rings Cranks
Gear Blanks Pinion Blanks

JERSEY FORGING WORKS
16th St. and Jersey Ave. JERSEY CITY, N. J.

INGALLS-SHEPARD FORGING COMPANY

DROP FORGINGS

Weighing from 5 lbs. to 500 lbs.
Office, McCormick Building, Chicago
Works, Harvey, Illinois

Have Your Forgings made in Rockford—

We can save you money—give you accurate high grade forgings promptly and in quantities. Send samples or blue prints for quotations.

ROCKFORD DROP FORGE CO.
ROCKFORD, ILLINOIS

GENERAL DROP FORGE CO.
SPECIAL DROP FORGINGS OF ALL KINDS TO ORDER
SEND US PRINTS OR MODELS FOR PRICES
BUFFALO, N. Y.

FORGINGS

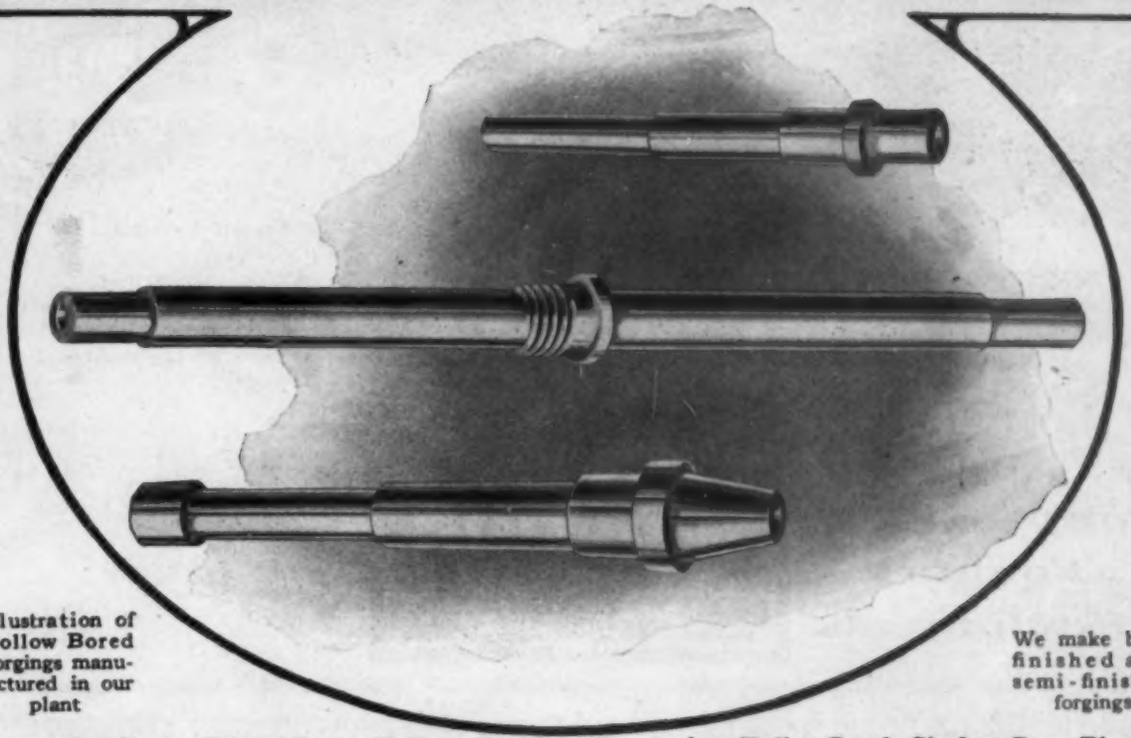


Illustration of Hollow Bored Forgings manufactured in our plant

We make both finished and semi-finished forgings

Connecting Rods; Piston Rods; Hollow Shafting; Eccentrics; Rolls; Crank Shafts; Gear Blanks; Heavy Forgings; Hollow Bored Forgings.

Let us know your requirements.

BAY CITY FORGE CO. ERIE, PENNA.

Drop Forgings FREIGHT CAR

We are Forging Specialists
Let us send you our Catalog

STEEL CAR FORGE COMPANY
PITTSBURGH, PENNSYLVANIA

The Drop Forging Company

Automobile Forgings

Forgings for fine tool and machine work

of New York
Jersey City, N. J.

HIGHEST DROP FORGINGS QUALITY

THE D. WILCOX MFG. CO.
MECHANICSBURG, PA.

AUTOMOBILE AND SPECIAL

DROP FORGINGS

Quality, Workmanship and Service—the best
Ask for our latest catalog or write for quotations.
RICHARD ECCLES CO., Auburn, N. Y.

THE

CLEVELAND HARDWARE CO.

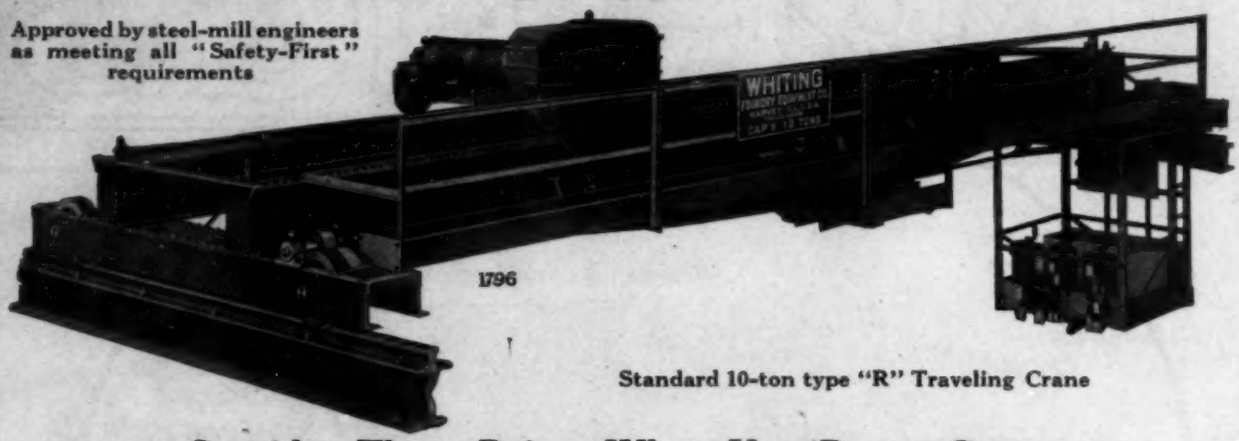
FORGINGS

The Largest Makers of
LIGHT DROP FORGINGS

CLEVELAND, OHIO

The Whiting Type "R" Crane

Approved by steel-mill engineers as meeting all "Safety-First" requirements



Standard 10-ton type "R" Traveling Crane

Consider These Points When You Buy a Crane:

Trolley gears operate in oil in dust-proof cases.
No trolley gears overhung.
Dependable brakes.
Positive limit switch.
Standard motors and controllers.
All gears and working parts readily accessible.
Substantial, rigid construction throughout.

Our Type "R" Embodies These Essentials

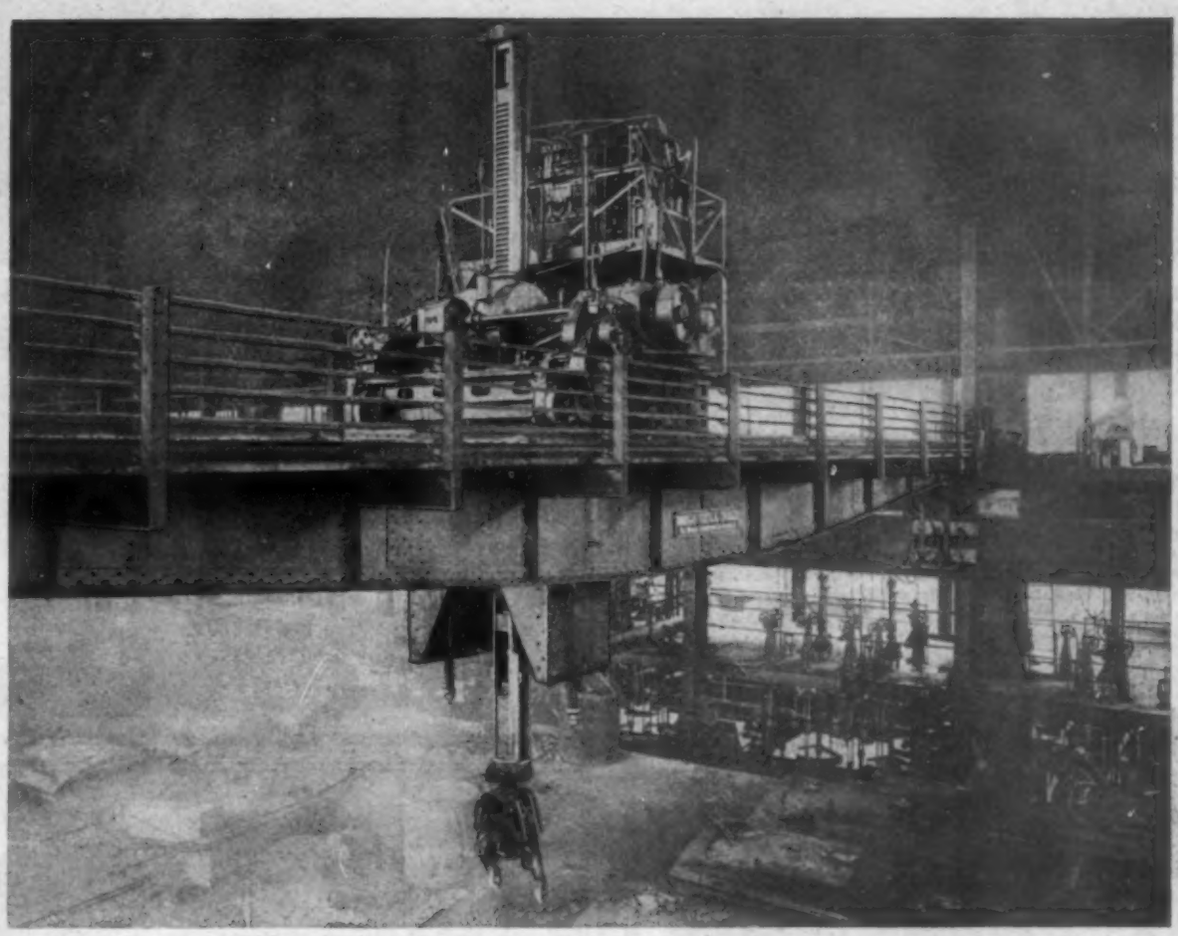
SEND FOR CATALOG 130

Complete Foundry Equipments

WHITING
FOUNDRY EQUIPMENT CO
HARVEY-ILL. U.S.A.
CHICAGO SUBURB

Cranes of all Types

Rack Type Soaking Pit Crane—*Exclusively Morgan*



113 in 49 Plants

That's the record made by Morgan soaking pit cranes. The one illustrated above is a 7½-ton rack type supplied to the Youngstown Sheet & Tube Co., Youngstown, Ohio.

Morgan equipment for steel mills is not only standard in America, but also in England, France, Austria, Switzerland, Russia, Japan, Chile, Australia, Canada, etc. That's why we term it

Morgan Equipment—The World's Standard

PITTSBURGH, PA.
Oliver Building
BIRMINGHAM, ALA.
American Trust Bldg.
BRUSSELS, BELGIUM
COPENHAGEN
TOKIO

The MORGAN ENGINEERING COMPANY
ESTABLISHED 1868
Alliance, Ohio. U.S.A.

NEW YORK
120 Broadway
PETROGRAD
M. Mett & Co
LONDON
PARIS

- THE MILWAUKEE CRANE -

THE MILWAUKEE CRANE

THE MILWAUKEE CRANE

MILWAUKEE ELECTRIC CRANE & MFG. CO.

NEW YORK: 50 CHURCH ST.

MILWAUKEE, WIS.

PITTSBURGH: 704 EMPIRE BLDG.

CRANES

for all purposes

Electric and Hand Power

Case Standard Cranes are the result of thoroughly tested ideas secured during many years from the best designing and operating engineers. They are manufactured under the most favorable conditions in a plant recently equipped at large expense for this particular purpose. They represent the greatest value for price charged.

The Case Crane & Engineering Co.

Electric Overhead Traveling Cranes

COLUMBUS, OHIO

O. S. LOCOMOTIVE CRANES

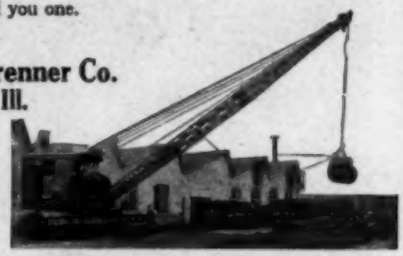
One O. S. Locomotive Crane will take the place of many men, and the work that would have taken the men days, is accomplished in minutes.

Our free catalogs illustrate the various uses of O. S. Locomotive Cranes. Let us send you one.

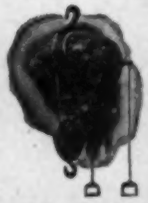
Write us immediately.

Orton & Steinbrenner Co.
Chicago, Ill.

SHOPS:
Huntington
Ind.



NORTHERN CRANES



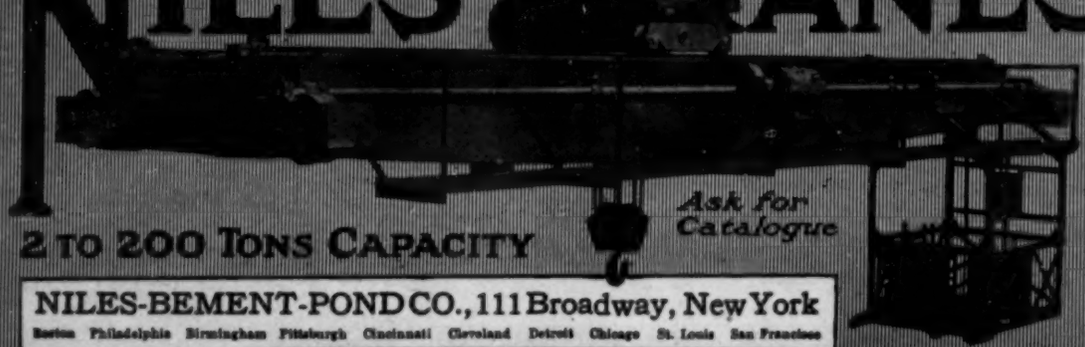
ELECTRIC and HAND TRAVELING CRANES
ELECTRIC and AIR HOISTS and TROLLEYS

NORTHERN ENGINEERING WORKS.

DETROIT, MICH. U.S.A.

Canadian Works—Northern Crane Works, Ltd., Walkerville, Ont.

NILES CRANES

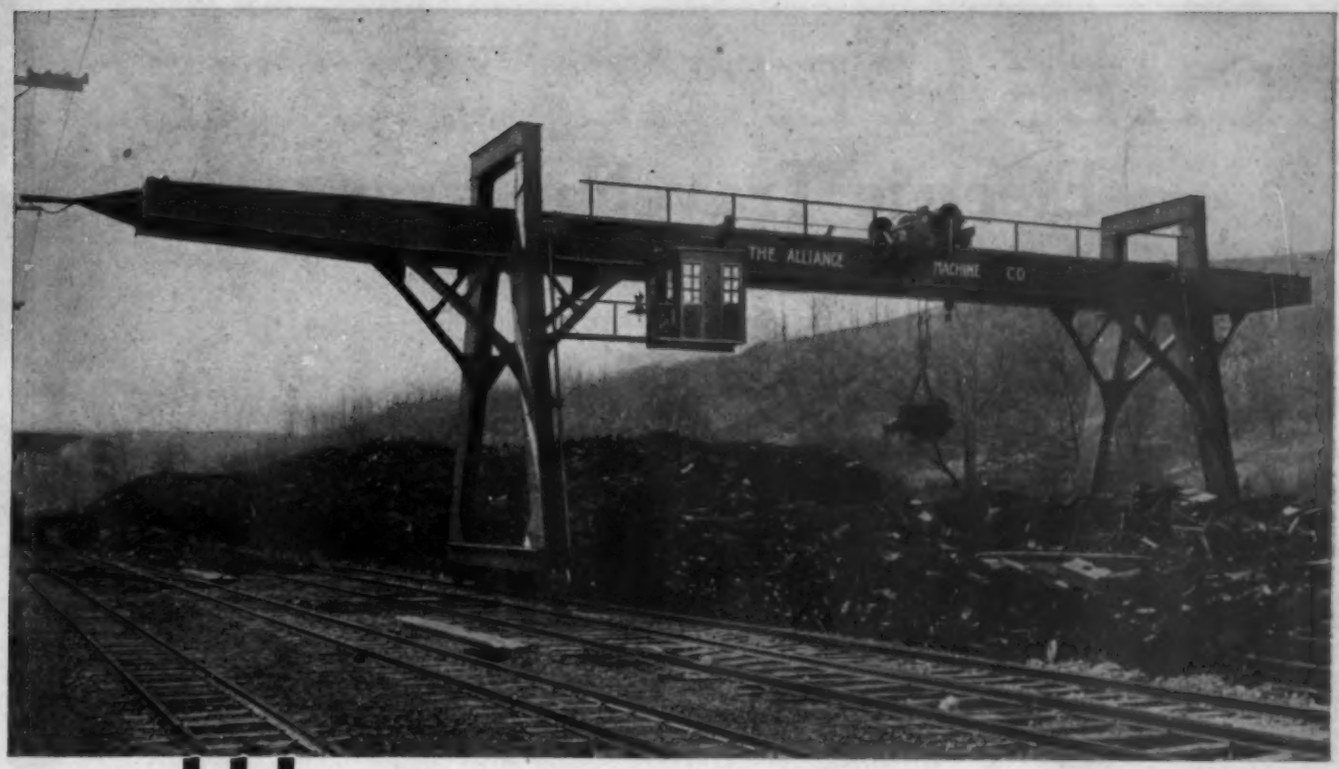


Ask for Catalogue

2 TO 200 TONS CAPACITY

NILES-BEMENT-POND CO., 111 Broadway, New York

Boston Philadelphia Birmingham Pittsburgh Cincinnati Cleveland Detroit Chicago St. Louis San Francisco



Double Cantilever Magnet Handling Crane

This crane was designed and built by us and is found in all modern steel plants.

It is most admirably adapted to stock yards of steel works and manufacturing concerns generally. The stock can be piled in between the gantry legs, as the cantilever ends extend over the railroad tracks and permit of quickly loading or unloading cars. In the case of steel works, scrap can be unloaded directly from railroad cars into the charging boxes. Built in any capacity or span.

There is nothing in cranes too large or difficult for us to build because we are the largest manufacturers of the world's largest cranes. Capacity 5 to 430 Tons.

Don't fail to get our interesting catalog.

THE ALLIANCE MACHINE CO.

ALLIANCE, OHIO

PITTSBURGH BIRMINGHAM

CHESAPEAKE CRANES

Electric Traveling Cranes

Most Rugged Crane Built

QUICK DELIVERY

CHESAPEAKE IRON WORKS, Baltimore, Md.

Euclid Hoists

are time and labor-savers. Their simple, rugged design insures dependable, everyday service.

Ask for our catalog.

The Euclid Crane & Hoist Co.
Euclid, Ohio

ELECTRIC TRAVELING

CRANES

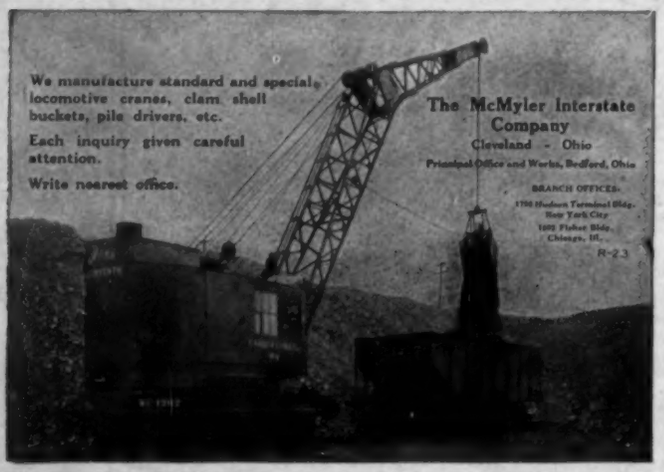
For Immediate Delivery

All Standard Makes 1 to 25 Tons

We Have Excellent Facilities For Quickly Altering to Meet Any Requirements.

N. B. PAYNE & CO. 25 Church Street NEW YORK CITY

Telephone Cortlandt 1800-2020



We manufacture standard and special locomotive cranes, clam shell buckets, pile drivers, etc.

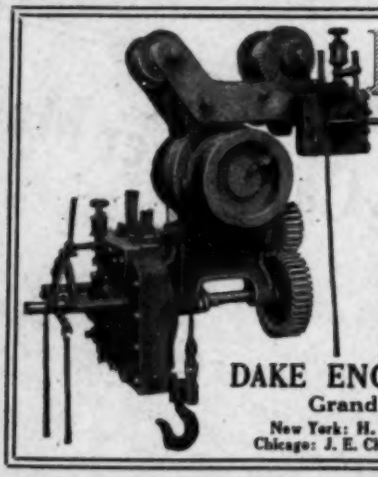
Each inquiry given careful attention.

Write nearest office.

The McMyler Interstate Company
Cleveland - Ohio
Principal Office and Works, Bedford, Ohio

BRANCH OFFICES:
1700 Hudson Terminal Bldg., New York City
1015 Fisher Bldg., Chicago, Ill.

R-23



DAKE HOISTS

are built for service. Made in different styles to suit every requirement.

Get our catalog of Pneumatic and Electric Geared Hoists, Steam and Air Motors, Hoisting Engines, Swinging Engines, Motor Crabs, Drill Hoists, Spud Hoists, Marine Machinery, etc.

DAKE ENGINE COMPANY
Grand Haven, Mich.

New York: H. L. Drullard, 30 Church St.
Chicago: J. E. Chisholm, Railway Exch. Bldg.

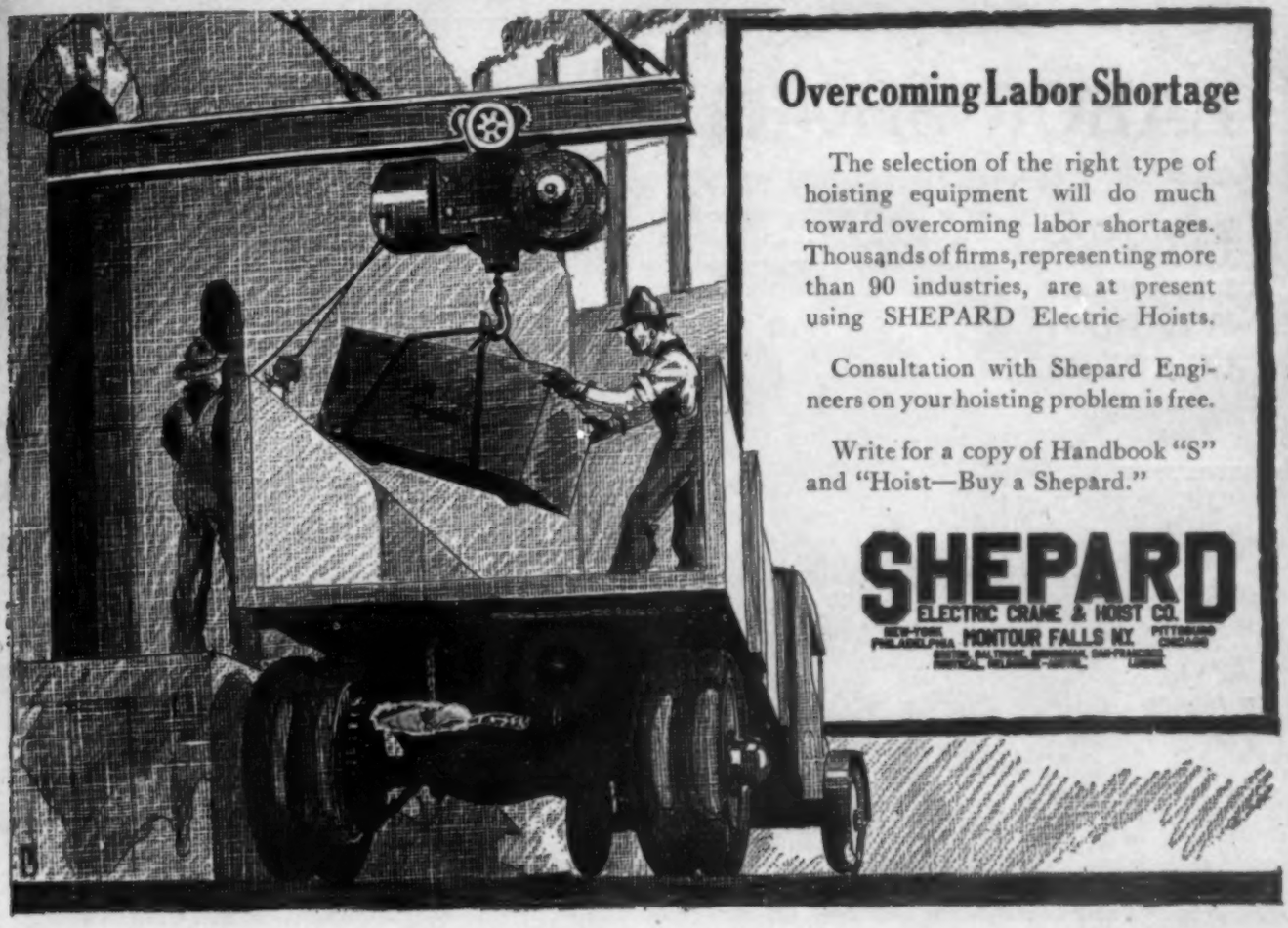
THE SHAW ELECTRIC CRANE COMPANY

WORKS MUSKEGON, MICHIGAN

SALES OFFICES IN ALL PRINCIPAL CITIES

MANNING, MAXWELL AND MOORE, INC.

PRINCIPAL OFFICE - 119 WEST 40TH. ST., NEW YORK.



Overcoming Labor Shortage

The selection of the right type of hoisting equipment will do much toward overcoming labor shortages. Thousands of firms, representing more than 90 industries, are at present using SHEPARD Electric Hoists.

Consultation with Shepard Engineers on your hoisting problem is free.

Write for a copy of Handbook "S" and "Hoist—Buy a Shepard."

SHEPARD
ELECTRIC CRANE & HOIST CO.
NEW YORK PHILADELPHIA MONTOUR FALLS NY. PITTSBURGH CHICAGO

BYERS AUTO CRANES

Clean up the big coal piles *in record breaking time*

Don't pay car demurrage—don't cause car shortage by permitting your coal to loaf on the siding. A **Byers' Auto Crane** will solve your problem. Can be used for material handling or excavating work. Operated with clamshell or orange-peel buckets, hook, skip or magnet. Mounted on rail trucks; road wheels or caterpillar. Steam, gasoline or electric power.

Write for Bulletins 1011, 1012, 1013.

THE JOHN F. BYERS MACHINE CO.
235 Sycamore St. Ravenna, Ohio.

LABOR SHORTAGE OVERCOME

HAISS
SELF-PROPELLED
WAGON
LOADERS

The Haiss Loader will take the place of many shovelers. It will do as much work as six or eight men in half the time. Moves about under its own power.

A yard a minute is its loading speed—one-half a cent a yard is its operating cost. Can be moved to any part of the plant, yard or to the railroad siding. Digs and loads coal, coke, sand, crushed stone, gravel, ashes, etc. Write for Bulletins describing this rapid loader in detail.

GEO. HAISS MFG. CO.
145th St. and Rider Ave. NEW YORK CITY

1 Cent per cu. yd.

1 cu. yd. Per Minute.

STORE YOUR COAL NOW

The Fuel Administration advises "If you don't want heatless days this winter, buy and store your coal now." Write us for data concerning our *Labride Equipment* which will handle your coal at a saving of 75-90%.

LAKESIDE BRIDGE & STEEL CO., 123 VILLARD AVENUE NORTH MILWAUKEE, WIS.

P & H CRANES

THE LOGICAL PURCHASE

All parts are accessible. Durability is obtained by liberal design. No gears or pinions are overhung. All gears are of cast steel. All pinions are of forged steel. All trolley bearings are bronze bushed.

Through bolts are used throughout.

PAWLING & HARNISCHFEGER CO. MILWAUKEE, WIS.

"A BUCKET FOR EVERY SERVICE!"

SINGLE HOOK BUCKETS for Foundry and Industrial Plants.
DOUBLE LINE BUCKETS for Cranes, Derricks and other installations.

WILLIAMS BUCKETS

The illustration shows a WILLIAMS No. 1 SINGLE LINE BUCKET handling coal in a Rubber Plant in the Akron District. Note the full load of bucket. This bucket can be used for ore, sand, gravel, crushed stone, etc., and for light excavating and dredging. It is built in sizes from ½ to 5 yards.

No matter what your requirements, we build a Williams Bucket that will do the work quickly and cheaply.

STANDARD BUCKETS in stock. SPECIAL BUCKETS on short notice.

Write Us

THE G. H. WILLIAMS CO.
ERIE, PENNA.

The MODERN WAY of handling ASHES is by the

GECO

GECO STEAM JET CONVEYOR
GREEN ENGINEERING CO.
EAST CHICAGO, IND.

Bulletin No. 1. Green Chain Grate Stokers.
Bulletin No. 2. Geco Steam Jet Ash Conveyors

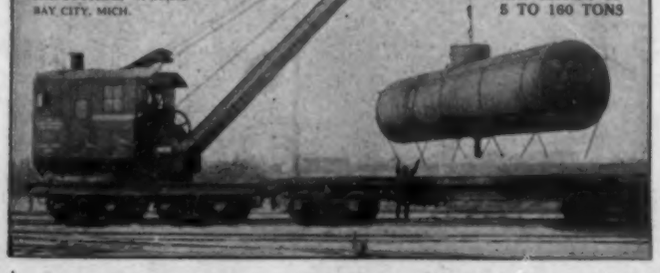
First aid to overworked labor and over-burdened payroll. Self-contained, easily and fully controllable, speedy digging and rehandling machine for indoor or outdoor use. Hooked up in a *jiffy* to any lifting machine. Catalog 44.
The Hayward Company, 50-54 Church St., New York

DEPENDABLE CRANES
FOR EFFICIENT WORK

Industrial Works Cranes

INDUSTRIAL WORKS
BAY CITY, MICH.

CAPACITIES OF
5 TO 160 TONS



BROSIUS

SINGLE HOOK GRAB BUCKETS

Three Phases of Performance That Count for Perfection

Simplicity the Fundamental Feature!

The **Single Hook** principle of "Brosius" Grab Buckets makes them the most suitable and adaptable bucket for **universal service.**

They can be attached to **any crane or hoist in a moment's time** without previous preparation. They trip by hand from the operator's cage or ground, without shock to crane or bucket.

More than 400 "Brosius" buckets in daily use. Write for bulletin.

EDGAR E. BROSIUS PITTSBURGH, PA.

RAYMOND SPRINGS

No. 107

are known for their quality wherever springs are used

All workmanship and material are thoroughly guaranteed. The *finish* is according to your specifications—japanned, nickeled, coppered, galvanized, oxidized or plain. *Let us do it.*

Write for Catalogue

Raymond Mfg. Co. Ltd.

Corry, Penna.

No. 108

BETTS

Heavy Duty Machine Tools

Fifty-seven years' experience in heavy machine tool building is exemplified in the Betts line which includes

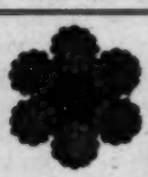
Planers, Boring and Turning Mills, Horizontal Boring, Drilling and Milling Machines, Tire Turning Mills, Car Wheel Borers, Slotters, etc.

Write for specific data regarding these machines

BETTS MACHINE CO.

409 Blossom Rd. Rochester, N.Y.

ROEBLING



Wire Rope and Wire

Made by

John A. Roebling's Sons Company, TRENTON NEW JERSEY

KNAPP FENCE

Factory Fence
Gates Wire Partitions
Window Guards
Machine Guards, etc.

KNAPP FENCE CO.
Cleveland, O.

WICKWIRE STEEL COMPANY

BUFFALO, N. Y.

MANUFACTURERS OF

High and Low Carbon Wire Rods

Steel Wire in all Carbons and Finishes

Nails, Barbed Wire and Staples

AWARDED GRAND PRIZE

American Wire and Peerless

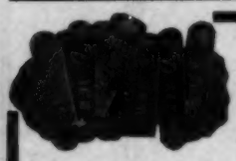
Tacks

combine all the essential features of good tacks, and are sold under our guarantee of full weight and full count. Furnished in either carpet, upholsterer, billposter or railroad styles; in finish—polished or blued, tinned, coppered or galvanized; packed in bulk, kegs or boxes, count papers, colored cartons or toy barrels. Illustrated catalogue and prices furnished.

American Steel & Wire Company

Chicago New York Cleveland Pittsburgh Worcester Denver

Export Representative: U. S. Steel Products Co., New York
Pacific Coast Representative: U. S. Steel Products Co.
San Francisco Los Angeles Portland Seattle



Metal Tags or Blanks

Used to show weight, size, length, etc. of bundles of your product. Can be supplied in tin, zinc, copper, or brass in any shape or size.

Write for our prices on your needs. Also you should have our catalogue. Ask for it.

PANNIER BROS. STAMP CO., 207-209 Sandusky St., Pittsburgh, Pa.

FORT PITT SPRING AND MANUFACTURING CO.

PITTSBURGH, PA.

Manufacturers of

COIL AND ELLIPTIC SPRINGS
VANADIUM
STEEL
SPRINGS

MONARCH WHYTE STRAND

WIRE ROPE

The most durable and reliable wire rope for *Hoisting, Hauling, Logging, Dredging,* etc.

You can depend upon it in the most severe crisis. It is the toughest rope for the roughest usage.

May we send Catalog M.?

MACOMBER & WHYTE ROPE CO.

KENOSHA, WISCONSIN

Blueprints

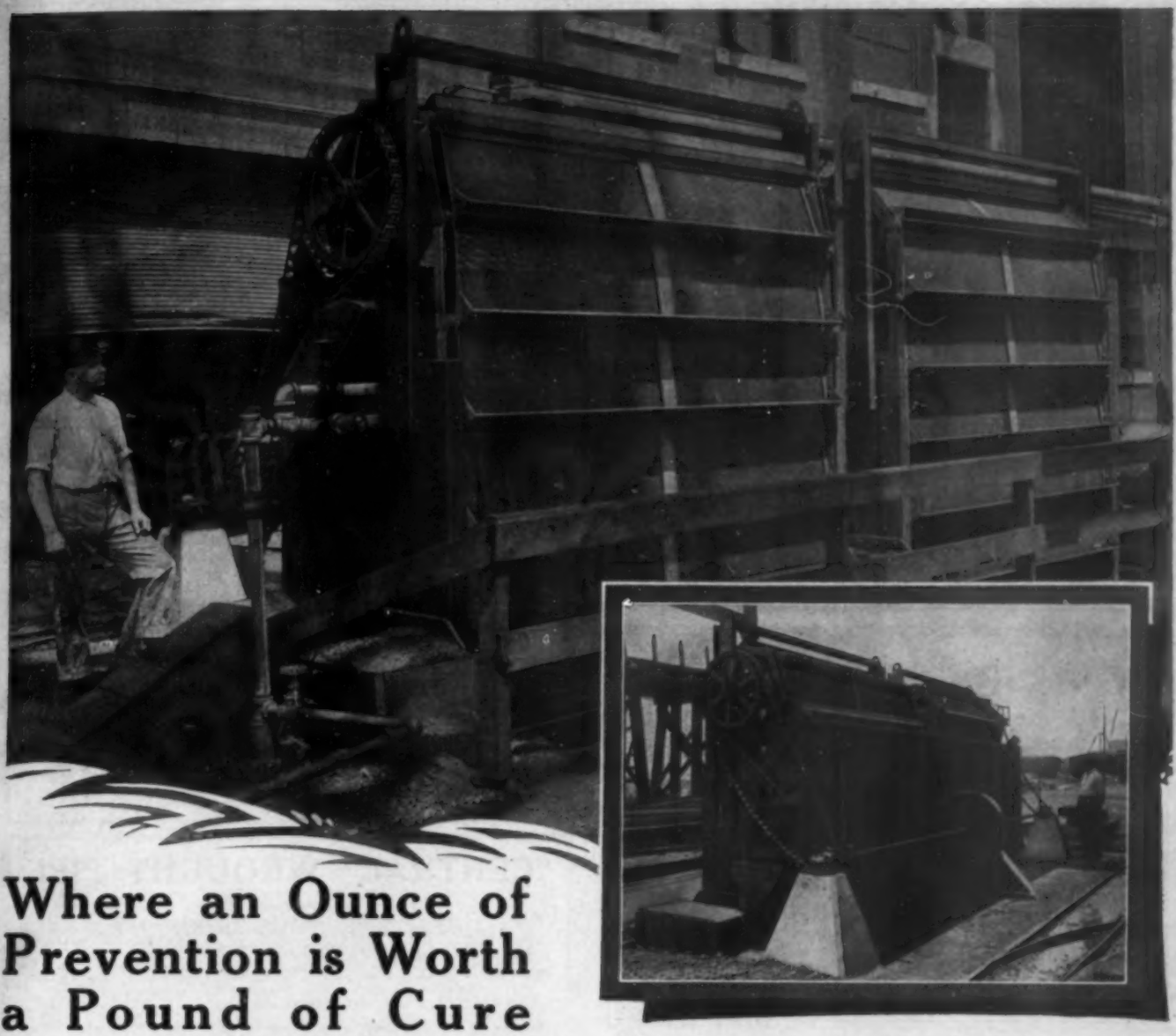
The Wickes

Continuous Electric. Sells at **half the price.** Uses **half the current** of others. Perfect prints up to 48" in width and of unlimited length.

Wickes Bros.

Department A

Saginaw - Mich.



Where an Ounce of Prevention is Worth a Pound of Cure

CLOGGED up condensers generally mean a shut down, a tremendous loss to the power user and the services of a crew of men for a considerable time in removing the debris and rubbish.

Link-Belt Traveling Water Screens insure a continuous flow of clear water to condensers and pumps. They remove and automatically dispose of all rubbish and trash before it can enter the intake. They operate just as effectively during floods as when water is at normal level. They reduce operating expense and increase the efficiency of your power producing equipment.

Our Book No. 305 describes our screens in detail and shows many installations. Send for a copy. If you will give us details of your intake conditions, our Engineers will gladly furnish recommendations and preliminary estimates for your particular needs.

LINK-BELT COMPANY

PHILADELPHIA		CHICAGO	
New York	299 Broadway	Kansas City, Mo.	306 Ehrhardt Bldg.
Boston	49 Federal St.	Seattle	576 First Avenue, S.
Pittsburgh	1501 Park Bldg.	Portland, Ore.	First and Stark Sts.
St. Louis	Cont'l Nat'l Bank Bldg.	San Francisco	582 Market St.
Wilkes-Barre	2d Nat'l Bank Bldg.	Los Angeles	163 N. Los Angeles St.
Cleveland	429 Rockefeller Bldg.	Toronto, Can.	Canadian Link-Belt Co., Ltd.
Detroit	732 Dime Bank Bldg.	Denver	Lindroth, Shubert & Co., Boston Bldg.
Minneapolis	418 S. Third St.	New Orleans	C. O. Hinz, Hibernia Bank Bldg.

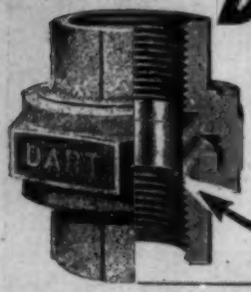
INDIANAPOLIS

196

LINK-BELT WATER SCREENS

RIGHT IN THE MOST VITAL PART every **DART UNION**

BRONZE TO BRONZE



is fitted with two bronze seats which cannot corrode. And the straight-way entirely through the union allows no place for foreign matter to start trouble.

Write Us

E. M. Dart Manufacturing Co.
PROVIDENCE, R. I.
The Fairbanks Co., Sales Agents
Canadian Factory:
DART UNION CO., Ltd., Toronto

BRONZE TO BRONZE

Bird's-eye view of our plant

"When you think of Piping, think of *Pittsburgh Piping."*

Personal supervision of the erection of every contract entrusted to us means that if we do your work you will be thoroughly satisfied. Let us know your requirement.

PITTSBURGH PITTSBURGH PIPING & EQUIPMENT CO. CHICAGO
CLEVELAND **People's Gas Bldg.**
American Trust Bldg. **Piping Manufacturers and Contractors** **SAN FRANCISCO Monadnock Bldg.**

SEAMLESS STEEL TUBING

PROMPT SHIPMENT FROM STOCK OF 500,000 FEET

ROME METAL PRODUCTS CO. Inc., 87 Nassau Street, New York, N. Y. WRITE FOR STOCK LIST

Valves, Fittings and Appliances

of every description for the installation of steam, gas, air, water and hydraulic piping.

TRADE MARK ATWOOD

Pittsburgh Valve, Foundry & Construction Company
Pittsburgh, Pa.

Engineers, Founders, Pipe-Fitters and Machinists.

Power Piping Co.

PITTSBURGH, PA
Factory: Beaver and Western Ave. Offices: B. F. Jones Bldg.

PIPING ENGINEERS

See our advertisement in first issues of month

"CENTRAL" WROUGHT PIPE

Manufactured by
CENTRAL TUBE COMPANY
PITTSBURGH, PA.

DISTRICT SALES OFFICES: New York, Chicago, St. Louis, Philadelphia, San Francisco, Minneapolis, Kansas City and Salt Lake City

Valves for Every Purpose—Everywhere

Colonial Valve Service Covers the United States

Just ask our Valve Department About It

COLONIAL SUPPLY COMPANY
MILL AND MINE SUPPLIES
217 Water Street - - - PITTSBURGH, PA.

DETROIT SEAMLESS STEEL TUBES COMPANY

Makers of

COLD DRAWN SEAMLESS STEEL BOILER TUBES

To Meet All
STANDARD SPECIFICATIONS
Incl. U. S. Navy—A. S. M. E.—A. S. T. M.—A. M. M. A.

Office and Mills: DETROIT, MICH.

VALVES and ENGINEERING APPLIANCES

THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI NEW YORK CHICAGO BOSTON LONDON

CHECK LITERATURE WANTED
SIGN AND MAIL
- ☐ BRONZE VALVES
- ☐ FERROUS VALVES
- ☐ BOILER MOUNTINGS
- ☐ ENGINE MOUNTINGS
- ☐ MOTOR ACCESSORIES

Portable Warehouse Scales

To **own** one, is to know that it is a **necessity.**
Guaranteed to give instant and accurate results.
We build scales for every purpose.
Ask for our catalog.

The Standard Scale & Supply Company
Pittsburgh, Pa.
New York—145 Chambers Street. Philadelphia—523 Arch St. Cleveland—1547 Columbus Rd. Chicago—169 N. May St.

ARMCO WELDING RODS

OXY-ACETYLENE ELECTRIC

make *safe* welding easy

ARMCO IRON Rods are practically pure iron and are peculiarly free from the sulphur, phosphorus, slag, oxides and other impurities that ordinarily destroy the homogeneity of the weld.

You would find it decidedly to your advantage to give ARMCO IRON Rods a careful test.

PAGE STEEL & WIRE CO.

Sales Offices:
30 CHURCH STREET, NEW YORK
Plants: MONESSEN, PA. and ADRIAN, MICH.
Western Representatives:
STEEL SALES CORPORATION - CHICAGO

THE PHOENIX IRON COMPANY

Manufacturers of Structural Steel Shapes of Open Hearth Steel

Fabricators of Riveted Work of Every Description for Bridges, Buildings and Structures of All Kinds

Designs and Estimates Furnished. Specialties, Phoenix Columns, Upset Eye Bars

General Offices: 20 So. 15th Street PHILADELPHIA

Snead Architectural Iron Works

LOUISVILLE, KY.

Structural Steel and Ornamental Iron, Large Stock of Standard and Bethlehem Shapes. Immediate Shipments Plain or Fabricated Material.

KIDD DRILL ROD

KIDD DRAWN STEEL COMPANY
ALIQUIPPA, PA.

Connecting Rods - Crankshafts Spindles - Special Forgings

We will appreciate an opportunity to quote on above finished ready to use or semi-finished.

Also STRAP JOINTS and MACHINE KEYS

The Wm. Leard Company

New Brighton - - Penna.

W. F. ABEL, President W. W. CRAY, Sec'y and Treas.

THE METALS SERVICE COMPANY

STEELS AND STEEL PRODUCTS

The object of this Company is to assist manufacturers in disposing of their excess or obsolete materials, especially Steel and Steel Products.

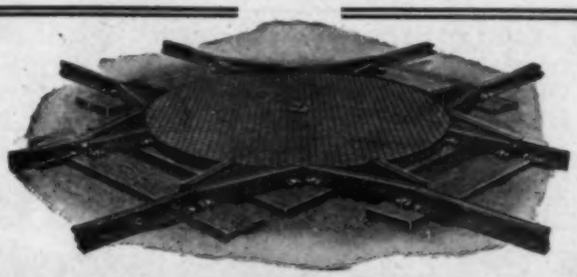
801 Union National Bank Building CLEVELAND

W. N. KRATZER & COMPANY

Structural Steel Work

Mill Buildings, Steel and Concrete Construction
Beams, Channels, Angles, etc., and Stock for rush orders

3212 to 3230 Smallman St., PITTSBURG, PA.



Roller Bearing Cars and Trucks of all kinds for all purposes, Switches, Turntables and Complete Industrial Railway Equipments.

Write us for Catalog and Prices

THE CHASE FOUNDRY & MFG. CO.
COLUMBUS, OHIO

BRASS RODS

ROUND HEXAGON SQUARE

WILLIAMS & CO., Inc.

220-226 PENN AVE.
PITTSBURGH, PA.

RIVETS

"PERFECTION"

Boiler, Ship and Structural

Made from Carnegie Steel
Highest Grade Rivets Made

Diam. ½" to 1½". All Lengths
Write for Prices and Monthly Stock Lists

Anthony Carlin Co.
Cleveland

Quaker City Rubber Co.
Philadelphia, Pa.
Cap. 100,000 gal.—Ht. 128'

Pittsburgh-Des Moines Steel Co.

Elevated Steel Tanks

Standpipes — Barges, Bridges
Office Buildings — Wireless Towers

Write for Catalog No. 9

Sales Offices:

Pittsburgh, Pa., - - - 849 Curry Bldg.
New York City - - - 46 Church Street
Dallas, Tex., - - - 1219 Praetorian Bldg.
Chicago, Ill., - - - 1282 First Nat'l Bk. Bldg.
San Francisco, Cal., - - - 7316 Rialto Bldg.
Washington, D. C. - - - 959 Munsey Bldg.

DES MOINES BRIDGE & IRON CO.
984 Tuttle St., Des Moines, Ia.
Shops: Pittsburgh, Pa., Des Moines, Ia.
Canadian Shops: Chatham, Ont.

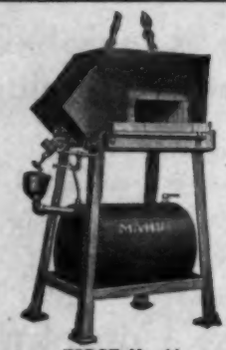
TRADE **L-XX** MARK **HIGH SPEED STEEL**

And other Tool Steel of Quality

NEW YORK, DETROIT, PITTSBURGH, ST. LOUIS, CHICAGO, BUFFALO

ATLAS CRUCIBLE STEEL CO.
Works and General Offices, Dunkirk, N. Y.

BOSTON, CLEVELAND, MINNEAPOLIS, MONTREAL and TORONTO
Executive Offices BUFFALO



FORGE No. 16

MAHR

OIL-FUEL RIVET FORGES

Insure against scaly, imperfectly heated and burned rivets.

Write for descriptive matter.

MAHR MFG. CO.
MINNEAPOLIS, MINN.

SHIP RIVETS

DAILY CAPACITY — 75 TONS

TRADE N MARK

NATIONAL BOLT & NUT CO.
PITTSBURGH, PA.

STANDARD SCREW PRODUCTS CO.

Screw Machine and Electric Welded Products

DETROIT, MICH. Estimates to your specifications

Accurate Screw Machine Products

THE ATLANTIC MFG. CO.
MILFORD CONN.

FERRY

Concentration and Conservation

We Concentrate on Good Workmanship
We Conserve Steel by Our Special Process

The Ferry Cap and Set Screw Co.
2149 SCRANTON ROAD CLEVELAND, O.

QUALITY — SERVICE

UNION ELECTRIC STEEL COMPANY

KEYSTONE BANK BLDG.
PITTSBURGH, PA.

Manufacturers of

HIGH GRADE ALLOY STEELS
HEROULT ELECTRIC FURNACE PROCESS

WORKS: CARNEGIE, PA. — GEN. OFFICES: PITTSBURGH, PA.

PACIFIC COAST STEEL CO.

SAN FRANCISCO — SEATTLE

OPEN HEARTH **STEEL**

BARS ANGLES CHANNELS LIGHT RAILS

ALL SIZES AND TYPES
QUOTATIONS ON REQUEST

Interstate Iron and Steel Co.

Open Hearth Steel Ingots, Billets and Slabs
Open Hearth Alloy Steels
Iron and Steel Tie Plates
Bars and Shapes—Wire Products

104 S. Michigan Ave., Chicago

Edwards Rolling Steel Doors

Patented Spring Release Mechanism causes door to close automatically in case of fire. Substantially constructed of special cold rolled strip steel in all types and sizes up to 40 feet wide and 100 feet high. Spring balanced for hand, chain or power operation.

Our Engineering Department will submit plans and specifications. Write today for Catalog.

THE EDWARDS MANUFACTURING CO.
Lester G. Wilson, Cons. Eng.
401-451 Culvert Street - CINCINNATI, O.
Steel Lockers, Shelving Bins, Portable Steel Buildings, Etc.

STAMPINGS

OF ALL DESCRIPTIONS
FROM ALL METALS UP TO 13/16" THICK

We own and operate the largest and heaviest drawing and forming presses in the world.
Heavy and light, cold pressed work of all kinds in any material.
Get in touch with us, our prices and workmanship are right.

THE BOSSERT CORP., Utica, New York

THE GRIFFIN MANUFACTURING COMPANY.
ERIE PA.
MANUFACTURERS OF
BEST FOR STAMPING AND DIFFICULT DRAWING
COLD ROLLED STRIP STEEL
MADE IN ALL WIDTHS 1/2" TO 16" INCLUSIVE IN USUAL GAGES
ACCURATE TO GUAGE ... SUPERIOR FINISH

Standard Tin Plate Company
CANONSBURG, PA.
Tin Plates, Black Plates, Terne Plates
ALL GRADES, COATINGS AND FINISHES
Our recent increased capacity for common Terne and Black Plates solicits further patronage
Also Tin Plates of Our Usual Good Quality

QUALITY COKE
TIN PLATE
THE LIBERTY STEEL CO.
WARREN, OHIO

LACLEDE STEEL COMPANY, St. Louis, Mo.
Hot Rolled Strip Steel
Concrete Reinforcing Bars
Railway and Industrial Forgings

Works:
Madison, Illinois
Alton, Illinois
East St. Louis, Ill.

General Offices:
1209 Federal Reserve Bank Bldg.
St. Louis, Mo.
Chicago Office: 208 S. La Salle Street

CUMBERLAND STEEL COMPANY
TURNED AND GROUND CUMBERLAND, MD.
HIGHLY POLISHED SHAFTING U.S.A.

Only Makers of "CUMBERLAND GROUND" Shafting
Large Stocks Quick Shipments

This screen does the final cleaning of coal better than any other device known

Write for Circular 21

Our Patent Flanged Lip Screen

PERFORATED METALS
OF EVERY DESCRIPTION
Elevator Buckets, Stacks and Tanks

HENDRICK MFG., CO.
Carbondale, Pa.
New York Office:
30 Church St.

Pressed Steel Parts

The price is always a factor. Our prices are right and our product is of the best.
A trial will surely convince you.

Gier Pressed Steel Co.
Lansing, Mich.

Engineering Directory

Metallurgical Research and Heat Treating Engineers

Microphotographs Physical Tests Chemical Analysis

American Incandescent Heat Co., Inc.

10 Post Office Square Boston, Mass.

The Bellefontaine Bridge & Steel Co.

STEEL CONSTRUCTION

For Mills, Factories, Train Sheds, Machine Shops, Bridges, Viaducts, Etc.

BELLEFONTAINE, OHIO

BLAIR ENGINEERING CO.

BLAIR PORTS AND VALVES

For Open Hearth Furnaces

343 SOUTH DEARBORN ST. CHICAGO

428 UNION ARCADE PITTSBURGH, PA.

17 BATTERY PLACE NEW YORK

FRANK I. ELLIS

Consulting Engineer

Rolling Mills, Pipe Mills, Forge Shops and Special Machinery

2127 Farmers' Bank Bldg., Pittsburgh, Pa.

FREYN, BRASSERT & COMPANY

ENGINEERS

People's Gas Building, Chicago

Coke Ovens Blast Furnaces Steel Works

Construction Equipment Operation

GENERAL BRIQUETTING COMPANY

Consulting Engineers

25 Broad Street New York

Specialists in the Briquetting of Flue Dust, Concentrates, Steel Turnings, Cast Iron Borings, etc.

Julian Kennedy

ENGINEER

Cable Address

Engineer, Pittsburgh Pittsburgh, Pa., U. S. A.

ALEX LAUGHLIN & CO.

ENGINEERS and CONTRACTORS

First National Bank Building

PITTSBURGH, PA.

THE W. R. MILLER COMPANY

Buildings, Furnaces and Other Equipment Pertaining to Steel and Iron Works

FORTER GAS PRODUCERS

Also Highest Type of Mechanically Operated Producers

Coal Handling Plants PITTSBURGH, PA. Forter Reversing Valves

W. E. MOORE & CO.

ENGINEERS

Specializing on Electric Steel Furnace Installations. Heavy Electric Motor Drives, Power Plants and Efficiency Investigations

Union Bank Building, PITTSBURGH, PA.

The Mount Vernon Bridge Company

ENGINEERS AND BUILDERS

Blast Furnaces, Ore and Coke Bins, Trestles, Skip Bridges, Mill Buildings, Bridges and Structural Steel Work.

Mount Vernon, Ohio

THE S. R. SMYTHE COMPANY

ENGINEERS AND CONTRACTORS

Steel Works, Rolling Mills, Blast Furnaces, Hot Blast Stoves, Furnaces for all purposes, Operated with Producer Gas, Natural Gas, Oil or Pulverized Coal. Coke Ovens. Gas Producers, Hand Operated or Mechanical.

Schild Sliding Gas and Air Reversing Valves

THE VALVE OF THE ERA

Highest Efficiency Guaranteed PITTSBURGH, PA.

Wm. SWINDELL & BROTHERS

ENGINEERS AND CONTRACTORS

Open Hearth and Crucible Steel Melting Furnaces
Heating and Annealing Furnaces
Gas Producers, Furnace Reversing Valves 21° to 36°
Gray Iron Castings, up to 10,000 pounds

Jenkins Arcade Building PITTSBURGH, PA.

I. C. WOLSTONCROFT

ANALYTICAL CHEMIST

Specializing in the Analysis of
IRON AND STEEL WORKS MATERIALS
All Work Given Personal Attention

P. O. Box 16 McKees Rocks, Pa.

Engineering Directory

ELECTRIC STEEL FURNACES

LUDLUM ELECTRIC FURNACE CORPORATION

NEW YORK CITY CHICAGO

Gwynn Gas and Oil Burners

used on

High Temperature FURNACES

For Heating Plates, Forgings, Ingots, Gears, Rods, Etc.

Catalog No. 35-1T

THE GWYNN ENGINEERING CO.

100-108 Liberty Ave. Pittsburgh, Pa.

METALLURGICAL ENGINEERS

THE STEEL IMPROVEMENT & FORGE COMPANY CLEVELAND

H. B. DEMPSEY FURNACE CO.

253 Broadway, New York

Heating Annealing Tempering

INDUSTRIAL HEATING FURNACES

ELECTRIC STEEL FURNACES

Forging Welding Hardening

THE ALLIANCE STRUCTURAL COMPANY

ALLIANCE, OHIO

Engineers and Fabricators of Steel Construction

We have a new and well-equipped plant for fabricating bridges, girders, beams and buildings either to our customers' or our own designs.

G.W. McCLURE SON & CO.

BLAST FURNACES

OPEN HEARTH HEATING

HOT BLAST STOVES

BESSEMER BLDG., PITTSBURGH, PA.

Arthur G. McKee & Co.

Consulting and Contracting Engineers

Blast Furnaces, Hot Blast Stoves, Storage Bins, McKee Revolving Distributors, Power Plants, Heavy Construction.

Reports, Appraisals and Investigations

Rockefeller Building, Cleveland, Ohio

POWDERED COAL

Prepared, Distributed and Burned by

THE QUIGLEY METHOD

is backed by the Quigley Organization of experienced Fuel and Furnace Engineers. We make reports, design, construct and operate complete plants for preparing, distributing and burning powdered coal.

Quigley Furnace Specialties Co., 26 Cortlandt Street New York

Blast Furnaces Steel Works

Special Cars of Every Description; Heavy Plate, Foundry and Machine Work

PENNSYLVANIA ENGINEERING WORKS

NEW CASTLE, PENNA.

AMERICAN FURNACES

for Annealing—Forging—Heat Treating

AMERICAN SHOP EQUIPMENT Co.

Hudson Terminal New York *McCormick Bldg. Chicago* *Citizens Bldg. Cleveland*

ROGERS, BROWN & CO.

PIG IRON
COKE

Bessemer Ferro Silicon — Ferro Chrome — Ferro Silicon — Magnesite

Manganese, Chrome and Iron Ores

Ferro Manganese — Fluor Spar — Spiegeleisen

Cincinnati, Philadelphia, Pittsburgh — Buffalo, Chicago, Boston — New York, Cleveland, St. Louis

Crocker Brothers

PHILADELPHIA NEW YORK CINCINNATI

Foreign and Domestic
Ferro-Manganese
Ferro-Silicon
Pig Iron Coke

E. N. Breitung & Co.
LAKE SUPERIOR
IRON ORES
Rockefeller Building CLEVELAND, O.

Oglebay, Norton & Co.
LAKE SUPERIOR
IRON ORES
CLEVELAND, OHIO

Eaton, Rhodes & Co.
Alloys
Pig Iron Coke
Ferro-Silicon
1645 Oliver Bldg. PITTSBURGH, PA.
First National Building CINCINNATI, O.

Ferro Manganese Ferro Silicon **FRANK SAMUEL** Spiegeleisen Silicon Spiegel
Iron Ore for Special Iron. Manganese and Chrome Ore
Pig Iron, Foundry Mill and Special Low Phosphorus
American-Swedo Iron Co.'s Special Low Phosphorus Melting Bar.
MAIN OFFICE Harrison Bldg. Philadelphia
NEW YORK OFFICE 39 Cortlandt Street New York City
BOSTON OFFICE 11 Ricker Road Newton, Mass.

McKeefrey & Co.
PIG IRON LIMESTONE
COAL AND CONNELLSVILLE COKE
LEETONIA, OHIO

"STRUTHERS"
BASIC PIG IRON
THE STRUTHERS FURNACE CO.
Furnaces at Struthers, Ohio
Main Office, Citizens Bldg., CLEVELAND, OHIO

Mitchell-Diggins Iron Co.
CHARCOAL PIG IRON
CADILLAC, MICH.

THE THOMAS FURNACE COMPANY
Makers of
LOW PHOSPHOROUS :: PIG IRON
FREE FROM COPPER AND ARSENIC
MILWAUKEE, WIS.

"Niagara" 50% Ferro-Silicon
Immediate Shipment
NIAGARA ELECTRIC FURNACE CO., Inc.
3rd and Walnut Streets, Niagara Falls, N. Y.

The Tod-Stambaugh Co.
IRON ORES
Perry-Payne Building CLEVELAND, OHIO

FERRO ALLOYS
METALS AND
ORES

FOUNDED 1869 BY GEO. G. BLACKWELL

Ferro Tantalum
Ferro Titanium
Metallic Manganese

FREE FROM CARBON

GEO. G. BLACKWELL, SONS & CO., LIMITED
THE ALBANY, LIVERPOOL, ENG.
Manufacturers, Metallurgists, Mine Owners, Merchants
WORKS: Garston Docks. CODES: A. B. C., Moreing and Neal, Lieber's and Western Union.

ALLOYS OF COPPER WITH THE RARE METALS
We make any and EVERY ALLOY AND METAL REQUIRED
We make a SPECIAL HIGH SPEED ALLOY FOR TOOL STEEL

Works: Buffalo, N.Y.
U.S.A.C.
Main Offices: 28 East 42nd St. New York City

50% FERRO-SILICON LUMP OR GROUND
PROMPT SHIPMENTS GUARANTEED
UNITED STATES ALLOYS CORPORATION

Standard Ferro-Manganese
Manganese Ore and Manganiferous Iron Ore
MARSHALL FURNACE, Newport, Pa.
LOCHIEL FURNACE, Harrisburg, Pa.
GRAHAM FURNACE, Graham, Va.

Edward E. Marshall
Bullitt Building
PHILADELPHIA, PA.

VULCAN IRON & STEEL CO.
(Formerly CARTER IRON CO.)
LOW PHOSPHORUS MELTING BAR
Mills: Paden City, W. Va.
Offices: Oliver Bldg., Pittsburgh, Pa.

MONONGAHELA IRON & STEEL CO.
(Formerly CARTER IRON CO.)
LOW PHOSPHORUS MELTING BAR
STAYBOLT IRON—ENGINE BOLT IRON
Works: Hays, Pa.
Offices: Oliver Building Pittsburgh, Pa.

50% Ferro Silicon
KEOKUK ELECTRO-METALS COMPANY
Works: Keokuk, Iowa
Sales Office: 136 So. La Salle St. CHICAGO, ILL.

GLOBE
The
Dependable
Bessemer Ferro-Silicon
All grades—10 to 17% Silicon
PROMPT SHIPMENT
BEST SERVICE

Pickands, Mather & Co.

CLEVELAND, OHIO.

PIG IRON · COAL · IRON ORES

BIRDS-EYE VIEW OF TOLEDO FURNACES

All Grades and Analyses, Soft and Strong Foundry, Malleable, Basic, Forge, Silvery and Bessemer Ferro Silicon Irons.

Shipments Made From

Toledo Furnace Co. - - Toledo, Ohio
United Furnace Co. - - Canton, Ohio
Perry Iron Co. - - - - Erie, Pa.
Jackson Iron & Steel Co. Jackson, Jackson Co., Ohio

Established 64 years

"THOMAS-VANADIUM" PIG IRON

Experience-Service Reputation-Quality

The Iron with the Long, Successful Record

THOMAS-VANADIUM

FOUNDRY
FORGE
BASIC

PIG IRON

Distinctive Dependable

The Thomas Iron Company

General Sales Office: Hokendauqua, Pa.

Philadelphia, 628 Stephen Girard Building

New York, 50 West Street Boston, 50 Congress Street

BESSEMER BASIC

PIG IRON

FOUNDRY MALLEABLE

WHARTON STEEL COMPANY

WHARTON :: NEW JERSEY

Low Phos. Pig Iron

Stewart Iron Company, Limited

Cleveland, Ohio

Works at Sharon, Penna.

W. P. SNYDER & CO.

The Shenango Furnace Co.

Oliver Building - - PITTSBURG, PA.

Miners and Lake Shippers

LAKE SUPERIOR IRON ORES

Producers and Sellers

STANDARD GRADES of PIG IRON

COAL AND COKE

The Favorable Record

Established by

SOLVAY COKE

"THE FUEL WITHOUT A FAULT"

is well known to foundrymen. It has always been in the front rank and its reputation has been established by actual and practical use.

Any one of the Solvay Plants mentioned below may be depended upon to

Do its level best

to take care of you as you would wish to be looked after.

If for any reason it falls short of your expectations, you may be assured that it has done the best that could possibly be done under

The Existing Circumstances.

SEMET - SOLVAY COMPANY

Semet-Solvay Co., Detroit, Mich.
Deliveries from Detroit Ovens

Pickands, Brown & Co., Chicago, Ill.
Sole Agents—Chicago and Milwaukee Ovens

Eaton-Rhodes & Co., Cincinnati, Ohio
Sole Agents—Ashland, Kentucky Ovens

Semet-Solvay Co., Syracuse, N. Y.
Syracuse, N. Y. Ovens

WHEN ALL OTHERS FAIL

TO CURE YOUR METAL ILLS

CONSULT US

Send for our list of HOMEOPATHIC REMEDIES for all metal ailments,—"from gold to steel."

Our BORONIC PRODUCTS (all-metal, in shot form) are used by the Mints and the largest manufacturers of metal products in the world. (35 distinct numbers)

THE BORONIC PROCESS

for deoxidizing, strengthening, purifying, toughening and solid-casting (for improving the physical structure of all metals); for renewing scrap material and producing the finest anti-frictional (lead-copper) products that can be made.

IS THE SIMPLEST AND CHEAPEST PROCESS KNOWN

See our advertisements in the National Telephone Directory (Classified) of the Reuben H. Donnelly Corporation. Our lists of products are filed with and can be seen at all the service stations of this corporation.

Send for our literature and Price List NOW.
You will be greatly benefited if you ACT NOW.

American Boron Products Company

INCORPORATED

READING, PENNA., U. S. A.

Sole Manufacturers

FOREIGN DISTRIBUTORS:

National Alloys, Limited.....London, England
Edward Le Bas & Company.....London, England
China & Japan Trading Company, Ltd.....Kobe, Japan
China & Japan Trading Company, Ltd.....Shanghai, China

BABBITT METAL

FROM THE BEST RAW MATERIALS

We don't care if we sell only fifty pounds of U. S. A. Babbitt Metal in a year because of our policy of using the best of raw materials only, and our policy of charging for the cost of Metals plus a fair legitimate margin of profit—this policy will be unchanged and U. S. A. Babbitts will always be made to a quality not a price standard.

Our large sale of U. S. A. Babbitts proves the trade wants a better Babbitt. Our prices are lower than you would think possible for such high class Babbitts—

Write for Babbitt Booklet—It tells the story.

Get the Habit—Use U. S. A. Babbitt

United Smelting & Aluminum Co., Inc.

MAIN OFFICE: NEW HAVEN, CONN.

Works: New Haven and Hamden, Conn.

NEW YORK—2316 Woolworth Bldg. CHICAGO—959 Monadnock Block
PITTSBURGH—Union Arcade Bldg. DETROIT—74-76-78 Fort St., East

To Remove Paint, Japan, Lacquer and Enamel

the use of

WYANDOTTE METAL CLEANER

proves how quickly, how uniformly and how economically the desired results can be accomplished.

May we give you full particulars concerning the use of this specialized cleaner?

THE J. B. FORD CO., *Sole Mnfrs.* Wyandotte, Mich.

REILLY-PEABODY FUEL CO

Connellsville Coke
By-Product Coking
Gas and Steam Coals

Coal Coke

From our own and affiliated ovens and mines

FRICK BUILDING PITTSBURGH PA.

MINERVA TUNGSTEN CORPORATION

330 Investment Bldg. :: LOS ANGELES, CAL.

Producers of

Scheelite Concentrates

Mines and Works—White Pine County, Nevada

CHARCOAL PIG IRON

Superior Charcoal Iron Co.

GRAND RAPIDS, MICH.

WELDED BOXES AND BOTTOMS —OUR SPECIALTY— FOR TIN PLATE TRADE

PITTSBURGH ANNEALING BOX CO

LAST LONGER PRODUCTS

629 BEAVER AVE. PITTSBURGH, PA.

NEW AIR-TIGHT BLAST GATE

FOR LOW AND MODERATE PRESSURES

(Patented)

"The only solution we have found for the problem of handling low pressure air without a loss." THE STUDEBAKER CORPORATION, Detroit, Mich.

Our NEW AIR-TIGHT BLAST GATE will save that air (money) you are now losing thru leaky blast gates. ¶ Circular 128-G explains its many other advantages, outlining clearly its all-around superiority over the ordinary light, flimsy, cheap, leaky and unreliable blast gates, and the heavy, cumbersome, expensive and slow-acting gate valves and stop cocks. Ask for circular and list of users.

W. S. ROCKWELL COMPANY

Furnace Engineers and Contractors

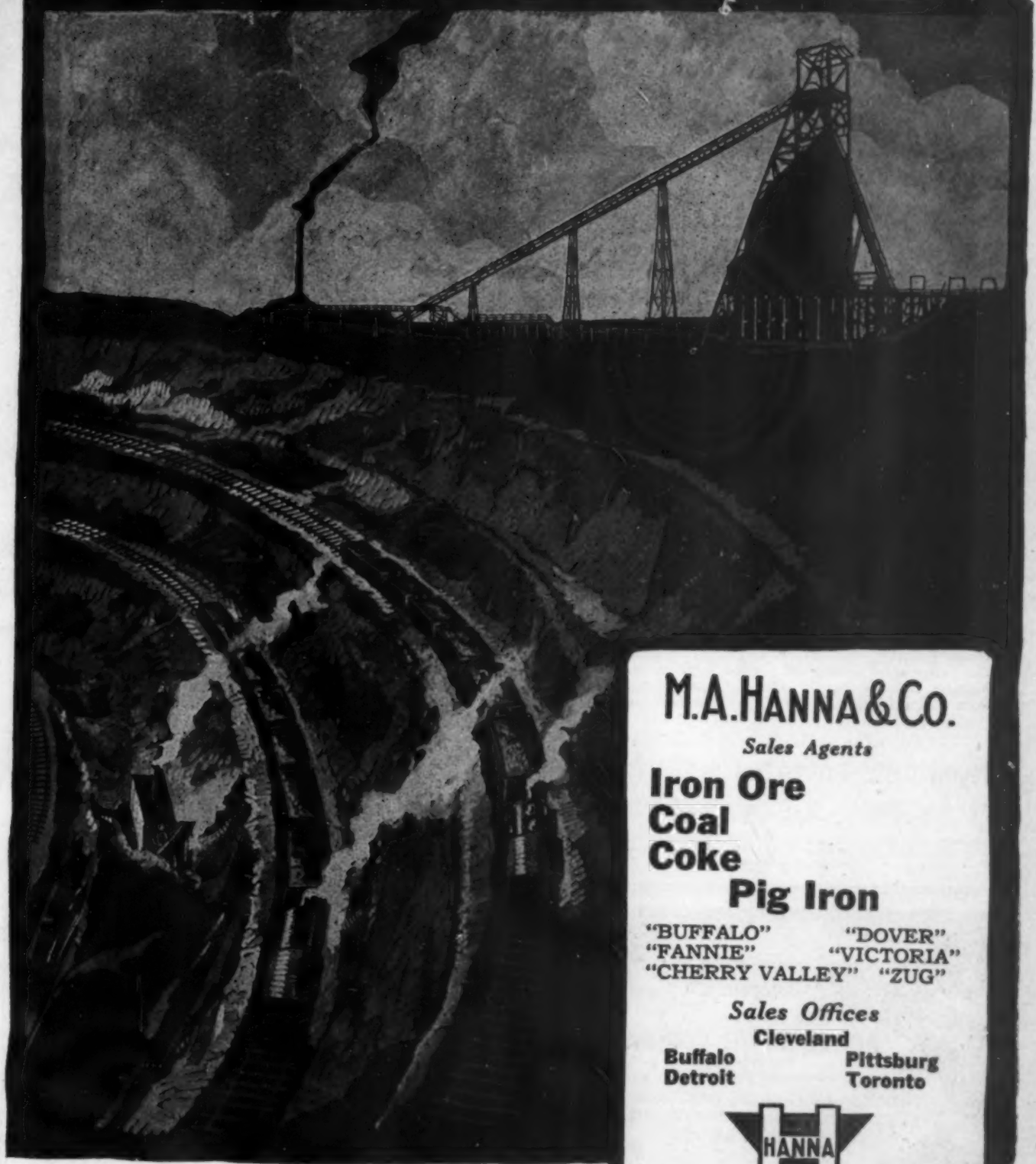
50 CHURCH STREET (Hudson Terminal Building) NEW YORK

Franklin W. Merritt

514 Plymouth Building
MINNEAPOLIS, MINN.

Miner and Shipper of high grade **Manganiferous ore.** Have two producing mines on the Cuyuna Range in Minnesota, known as the Merritt No. 1 and 2 and the Ida Mae No. 1; both containing high grade Manganiferous Ore, Low Phosphorus and Low Silica.

HANNA



M. A. HANNA & Co.

Sales Agents

Iron Ore
Coal
Coke
Pig Iron

"BUFFALO" "DOVER"
"FANNIE" "VICTORIA"
"CHERRY VALLEY" "ZUG"

Sales Offices

Cleveland
Buffalo **Pittsburg**
Detroit **Toronto**

HANNA

Pulverized Jersey Fire Clay

Red, Blue and Grey Pulverized Fire Clay and Fire Mortar in Carlots a Specialty.

Daily capacity 100 tons.

Write us covering your requirements. Immediate Shipments.

Also manufacturers of Highest Grades Jersey Fire Brick and Special Fire Clay Products.

THE MUTTON HOLLOW FIRE BRICK CO.
WOODBRIDGE, N. J.

Clinton "Super-Heat" Fire-Brick Cement

The superior cement for the construction or repair of arches, furnace linings, boiler settings and fire brick work of every nature; brick and cement kilns, ovens, incinerators, crucibles, etc.

"Super-Heat" is a plastic, refractory compound, delivered in paste form ready to use. It's good enough for use by the U. S. Government and many large concerns—why not by you?

Write for Circular No. 2 and free test proposition.

Manufactured by
CLINTON METALLIC PAINT COMPANY
FACTORY OFFICE CLINTON, N.Y.
NEW YORK OFFICE 101 PARK AVENUE

Hy-brand Fire Brick

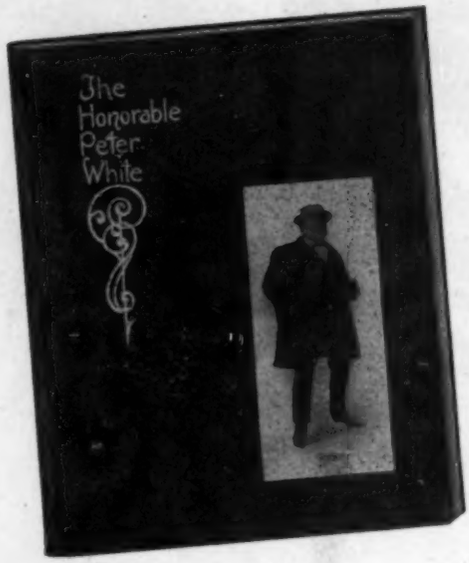
Hy-Brand St. Louis, No. 1, Hy-Brand Flint are suitable for such practices as: Boiler Settings, Flue Linings, Coke Ovens, Annealing Furnaces, Soaking Pits, Roasting Furnaces, Zinc Furnaces, Oil Refining Stills, Stoker Furnaces, Malleable Furnaces, Stove Linings, Puddling Furnaces, Heating Furnaces, Open Hearth Checkers, Crucible Steel Furnaces, and All Like Practices.

Write for particulars to us or our nearest Branch

Hydraulic-Press Brick Company

Fire Brick Dept. Lackland & Payne, Mngrs.
Saint Louis

Chicago, Cleveland, Davenport, DuBois, Pa., Indianapolis, Kansas City, Minneapolis, New York City, Omaha, Philadelphia, Toledo, Washington, D. C.



The Honorable Peter White

By R. D. Williams

A BIOGRAPHICAL and historical account of the beginnings and development of the Lake Superior iron ore industry. It traces every step from the first shipment of six barrels in 1852 to the present gigantic outflow of 50,000,000 tons yearly. Although every statement in the book is the result of patient investigation, it is not merely a dry recital of facts and figures, but reads as interestingly as any novel.

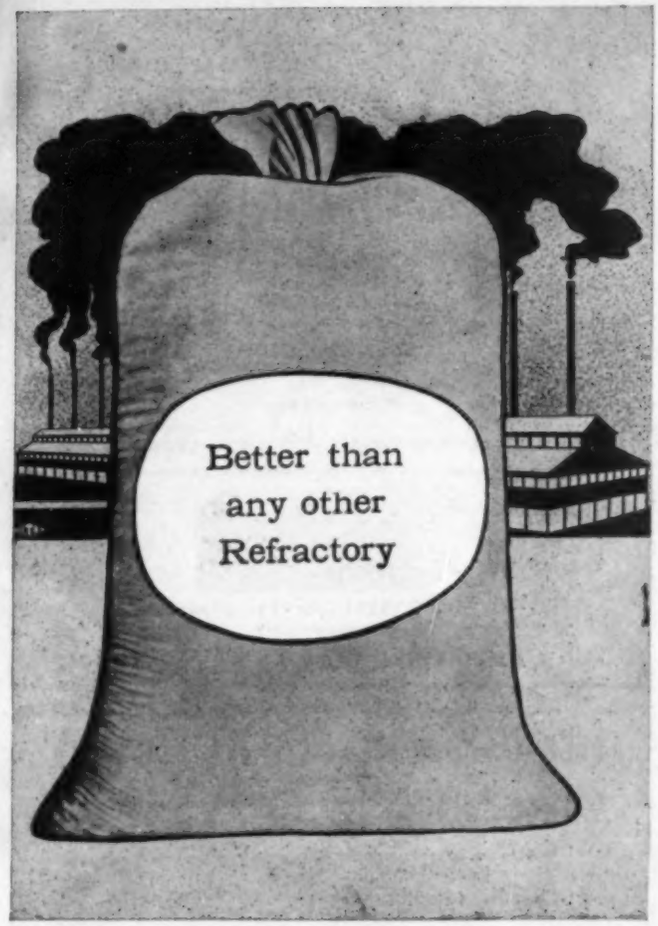
The Honorable Peter White is a book of direct interest to every man connected with the iron and steel working industries, and it forms an essential part of the knowledge of everyone who would know the beginnings of the great iron industry of the United States—the foundation of our industrial supremacy among the nations of the world today.

Artistically printed on heavy tinted paper—120 fine illustrations—cloth bound.

Price $2.00, postpaid

Penton's Book News
Cleveland, Ohio

208



Use Less Fuel Without Decreasing Your Production

If you are operating uninsulated heated equipment, you are losing heat that can be turned into production.

SIL-O-CEL
PREVENTS HEAT PENETRATION
TRADE MARK
MADE FROM CELITE

Insulation prevents heat loss—saves fuel and increases output.

"For Increased Output"

Complete data and blue prints furnished on any specific heat insulating problem.

CELITE PRODUCTS CO.

NEW YORK - - - 11 Broadway
PITTSBURGH - - Oliver Bldg.
CHICAGO - - Monadnock Bldg.
LOS ANGELES - - Van Nuys Bldg.
SAN FRANCISCO - Monadnock Bldg.

THE "CLEARFIELD" FIRE BRICK
MANUFACTURED BY
THE CLEARFIELD FIRE BRICK CO.
Office and Works at CLEARFIELD, PA.

HARBISON-WALKER REFRACTORIES CO.
MANUFACTURERS OF
High Grade Silica, Chrome,
Magnesia and Fire Clay Brick
Dead Burned Magnesite and Furnace Chrome
Chrome Ore
PITTSBURGH, PA.

DOVER FIRE BRICK CO.
Manufacturers of
HIGHEST GRADE PENNSYLVANIA AND OHIO
FIRE BRICK
"North Bend" "Dover" "Buckeye"
Cuyahoga Bldg. Cleveland, O.

B. C. NEELY
Lake Superior Iron and Timber Lands
Mining Options and Leases
Crystal Falls :: :: Michigan

FIRE BRICK
Tel. 620 COURT AND
FIRE CLAY
West Va. Fire Clay Manf'g. Co.
Diamond Bank Bldg. PITTSBURGH, PA.

For bonding and repairing fire clay or silica brick work, tile, retorts, crucibles, etc.
USE **HYTEMPITE** THE
(Reg. U. S. Pat. Off.)
High Temperature Fire Brick Cement.
Quigley Furnace Specialties Co.
26 Cortlandt Street New York

BRIGHTON FIRE BRICK
THE BEST FOR THE HARDEST SERVICE
ESPECIALLY ADAPTED FOR
Blast Furnace Tops; Hot Blast Stoves; Boiler Settings; Soaking Pits; Heating Furnaces; Cupola Linings; Gas Producers; Carburetors and Washers. Will not spall, crack or swell.
BRIGHTON FIRE BRICK CO., New Brighton, Pa.

Furnace Efficiency—

Improper heat insulation increases fuel costs and reduces efficiency.

You can prevent unnecessary fuel losses and increase the general efficiency of your plant by using

ADAMANT
FIRE BRICK CEMENT

It will increase the life of your fire brick from 100 to 500 per cent. It binds without heat—welds at 1500° F. and will withstand any temperature up to 3400° F. "Adamant" welds the brick together.

Details?

Botfield Specialties Mfg. Co.
Swanson and Clymer Streets
Philadelphia, Pa.
Write for literature and samples
New York Office: 106-110 West 34th Street

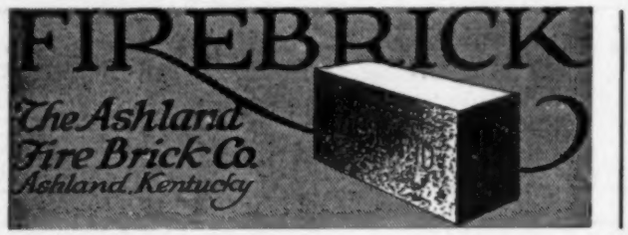
UNION MINING CO.
MT. SAVAGE, MD.
Proprietors of the
Mt. Savage Fire Brick Works
(SUCCESSFULLY OPERATED FOR 70 YEARS)
Manufacturers of
"Mt. Savage" "M. S. A." "Refracto" "Carburetor"
Mt. Savage, Md.
1113-1117 Fidelity Bldg. Baltimore, Md. | Oliver Bldg. Pittsburgh, Pa. | 50 East 42nd St. New York, N. Y.

Shippers of Ganister

"Salina"
"Lyon"
"Yough"
PITTSBURGH, PA.
Established 1845
Manufacturers of
HIGH GRADE FIRE CLAY AND SILICA BRICK

AMERICAN REFRACTORIES COMPANY
Manufacturers of
High Grade Silica, Magnesia and Chrome Brick
Dead Burned Magnesite
General Offices—Union Arcade Building Pittsburgh, Pa.
General Sales Offices—208 So. La Salle St. Chicago, Ill.
Eastern Sales Office—Equitable Building New York, N. Y.

Jos. Soisson Fire Brick Co.
CONNELLSVILLE, PA.



Save Labor—Use Machines
The Revolvator saves time, labor and storage space in piling barrels, bales, cases, etc.
Write for Bulletin No. TR
REVOLVATOR CO.
391 Garfield Avenue Jersey City, N. J.
Sales Agents: N. Y. Revolving Portable Elevator Co.

THE FAHNESTOCK MFG. CO.
AVONMORE, PA.
ACID OPEN HEARTH
STEEL CASTINGS
FROM 15 LBS. TO 15 TONS
For Mills, Railroads, Machinery, Ships and Government Specifications; Capacity doubled and surplus tonnage available for prompt delivery in form of castings or ingots.

POWERFUL LATHES

Bridgeford Lathes are built strong and powerful for severe service. They are made from the highest grade materials. Every lathe is designed by experts with years' experience. They are designed to be accurate as well as powerful.

Bridgeford Machine Tool Works
155 Winton Road ROCHESTER, N. Y.

THE A B C OF IRON AND STEEL

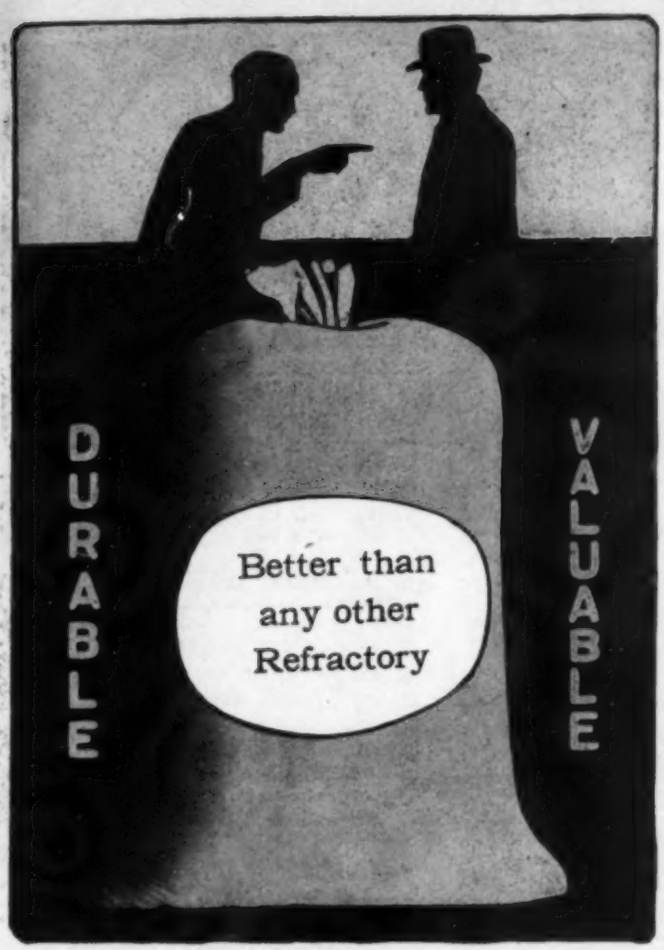
A new book giving a comprehensive description of every process involved in the manufacture of Iron and Steel, from the ore to the finished product.

Contains a complete directory of the Iron and Steel Works of the United States and Canada.

$5.00 per copy, Postpaid

WRITE TODAY and ask for our circular giving a brief description of the book and a Table of Contents.

PENTON'S BOOK NEWS
Penton Building 409 Cleveland, Ohio



No. 1. American Crude Clay
No. 1. American Ladle Clay
No. 1. American Steel and Malleable Clay
No. 1. American Foundry Clay
No. 1. American General Furnace Clay
No. 1. American Plastic Clay
No. 1. American Open Hearth Clay
No. 1. American Furnace Lining Clay
No. 1. American Notch Clay
No. 1. American Refractory Clay
No. 1. American Sagger Clay
No. 1. American Crucible Clay
No. 1. American Glass Pot Clay

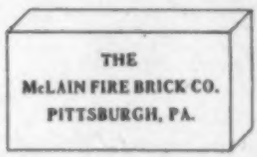
The American Fire Clay and Products Company
MINERS AND SHIPPERS
CLEVELAND, Sixth City

	Mines at
Old Hickory Cannel	Marquis, Ohio
Mahoning Gas Cannel	Canfield, Ohio
Fire Clay	New Buffalo, Ohio
Silica Sand	North Lima, Ohio

The Howe-Fuller Co. FIRE BRICK.
GENERAL OFFICES
Rockefeller Building,
CLEVELAND, OHIO
FIRE CLAY BRICK, FIRE CLAY, SILICA BRICK, SILICA CEMENT, CHROME BRICK, CHROME CEMENT, CHROME ORE, MAGNESIA BRICK, DEAD BURNT GRAIN MAGNESITE

"PYRO-STEEL"
for HIGH HEAT WORK
Made from the Famous Sciotoville Clays
The PYRO CLAY PRODUCTS Co., Oak Hill, Ohio
FIRE BRICK

"C STEEL"
"DANDO"
"BEAVER"
"IRONDALE"
"CROMER"



PAT. HOT TOP
SLEEVES
FIRE CLAY
WIRE CUT
SPECIAL TILE

The Orth Roof, Method of Roof Repair, Regenerator and Method of Slag Pocket Drainage for
OPEN HEARTH FURNACES
Also ORTH SILICA BRICK
Used in Standard practice by many of the largest steel plants in the country. Detailed information on request.
FRANK ORTH
3437 Fir Street Phone 1171-M Indiana Harbor, Ind.

FREEMAN FIRE BRICK CO.
Better and more economical results can be obtained by using Freeman Fire Brick for
OPEN HEARTH CHECKERS, BOILER SETTINGS, HEATING FURNACES, Etc.
We also specialize
Cupola Blocks and Special Shapes
Write us.

CHROME ORE
E. J. LAVINO AND COMPANY,
BULLITT BLDG. PHILADELPHIA.
MAGNESITE ORE

Employment

POSITIONS OFFERED
Minimum ad. set solid, 50 words $1.50
Minimum ad. all caps, 50 words $2.00

POSITIONS WANTED
Minimum ad. set solid, 25 words $0.50
Minimum ad. all caps, 25 words $0.75

Positions Offered

A WORKING MELTER TO TAKE CHARGE OF ACID O. H. FURNACE IN THE EAST. MUST COME WELL RECOMMENDED WITH EXPERIENCE ON SMALL FURNACE, POURING CASTINGS FROM 1 POUND TO 2000 POUNDS. AN EXCELLENT POSITION FOR THE RIGHT MAN. STATE SALARY EXPECTED AND FULL PARTICULARS IN THE FIRST LETTER. ADDRESS BOX 951, THE IRON TRADE REVIEW, CLEVELAND, O.

OPEN HEARTH STEEL FOUNDRY FOREMAN FOR PLANT IN THE EAST. ONE EXPERIENCED IN LIGHT AND MEDIUM WORK, 25 MOLDERS. STATE AGE, EXPERIENCE, REFERENCES AND SALARY EXPECTED. ADDRESS BOX 952, THE IRON TRADE REVIEW, CLEVELAND, O.

PIG IRON SALESMAN, EXPERIENCED, FOR REsponsible position. Must be familiar with foundry iron mixtures and practice. State age, experience, salary expected and references. Address Box 945, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—EXPERIENCED CORE-ROOM FOREMAN for malleable foundry located in Middle West, employing about twenty core-makers. State experience and salary wanted. Address Box 898, THE IRON TRADE REVIEW, Cleveland, O.

SALESMAN WANTED:—UNDERSTANDING ALLOY and Tool Steels. State fully, confidentially, experience, age, salary expected. Address Box 878, THE IRON TRADE REVIEW, Cleveland, O.

OFFICE MANAGER WANTED:—COMPETENT TO handle correspondence, sales and salesmen; experienced in high grade steel specialties, tool steel and alloy steels. To receive attention state age, experience in detail and salary required. Address Box 879, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—SEVERAL FIRST CLASS DESIGNERS OF ROLLING MILL MACHINERY, HYDRAULIC PRESSES AND SIMILAR HEAVY WORK WITH EXPERIENCE WITH BUILDERS OF SUCH MACHINERY. STATE AGE, EXPERIENCE AND SALARY. PERMANENT POSITIONS FOR QUALIFIED MEN. ADDRESS BOX 880, THE IRON TRADE REVIEW, CLEVELAND, O.

ALLOY AND TOOL STEEL SALESMEN WANTED familiar with Chicago and middle-west trade, also Boston and New England trade. Good salary for high grade men. Address Box 904, THE IRON TRADE REVIEW, Cleveland, O.

THE BEST WAY TO GET A GOOD POSITION IN drafting or engineering is to file an application direct with some of our clients who are depending on us to get competent and experienced applicants for their vacant positions. Send stamp for blank and list of vacant positions. The Cleveland Engineering Agency Co., Rose building., Cleveland, O.

SALES MANAGER COMPETENT TO ORGANIZE and direct branch offices and a force of salesmen to market High Grade Alloy and Tool Steel Products. Must be familiar with this branch of the business. Attractive inducements offered. Address Box 905, THE IRON TRADE REVIEW, Cleveland, O.

TOOL STEEL SALESMAN FOR CHICAGO AND vicinity, experienced in hardening and tempering High Speed, Alloy and Carbon Tool Steel. A splendid opportunity for man with personality, with well known manufacturer. State age, education (names of school), past employers, and salary expected. Send photograph with application to Box 920, THE IRON TRADE REVIEW, Cleveland, O.

Positions Offered

WANTED

FOREMAN

experienced in large production by

GRAY IRON FOUNDRY

located in large city in middle west for department embracing machine molding, light floor and bench work. Output largely internal combustion engines. Also Core Room Foreman. Good opportunities for competent men.

Address Box 860

THE IRON TRADE REVIEW

Cleveland, O.

MASTER MECHANIC, HIGH GRADE MAN, WITH STEEL PLANT EXPERIENCE. ADDRESS BOX 853, THE IRON TRADE REVIEW, CLEVELAND, O.

WORKS

MANAGER

To take charge of operation of a malleable foundry in the central west making railroad and automobile castings. Must not only be thoroughly competent to handle all details of foundry work but must also be broad enough to grasp the plant operation as a whole to the end that the most efficient results may be obtained. Technical man preferred. An exceptional opportunity that will pay well.

Address Box 930,

THE IRON TRADE REVIEW,

Cleveland, O.

Positions Offered

FOREMAN FOR TANK SHOP EMPLOYING ABOUT one hundred men. Man must have wide experience in manufacturing cylinder and pressure tanks, also in fabricating tanks for field erection. Man must be able TO SECURE RESULTS and for foreman so doing the opportunity is unlimited. Address communications giving experience, qualifications, etc., to Box 921, THE IRON TRADE REVIEW, Cleveland, O.

SUPERINTENDEINT

FOR

BARREL MANUFACTURING

Out-of-town corporation wants a production man who has had experience in the manufacture of steel barrels of both light and heavy gauge steel. Must be familiar with double seaming operation and oxy-acetylene welding. A splendid opportunity for a high class man. Give full information in first letter, which will be treated in confidence.

Address Box 866,

THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—TWO YOUNG MEN WITH DEferred classification to sell Tool Steel and Alloys in Ohio and Indiana. Hustle and ambition more essential than a technical knowledge of Steel. Address Box 815, THE IRON TRADE REVIEW, Cleveland, O.

COMPTROLLER

LARGE MANUFACTURER OF MACHINERY IN THE PITTSBURGH DISTRICT WILL CONSIDER APPLICATIONS OF HIGH GRADE MEN, WHO HAVE HAD EXPERIENCE IN THE MANUFACTURING LINE, TO ACT AS COMPTROLLER. GOOD PERMANENT POSITION FOR THE RIGHT MAN.

Address Box 947,

THE IRON TRADE REVIEW, Cleveland, O.

AN OPPORTUNITY FOR A YOUNG MAN WHO IS familiar with buying and selling new and second hand steel commodities. Must be a good trader. Salary and commission with an established New York concern. Experience necessary. Address Box 933, THE IRON TRADE REVIEW, Cleveland, O.

CLERK, STENOGRAPHER PREFERRED, MALE OR female, experienced in iron and steel business for warehouse office. Address Box 942, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—FIRST-CLASS BOOKKEEPER AND ASsistant familiar with iron business preferred. Apply to McKeefrey Iron Co., Leetonia, Ohio, stating age, reference and salary expected.

BOILERMAKER-FOREMAN FOR MODERATE SIZED SHOP IN THE PITTSBURGH DISTRICT. SPLENDID OPPORTUNITY FOR AMBITIOUS MAN TO ADVANCE VERY RAPIDLY IN A BUSINESS WHICH WILL NOT BE AFFECTED BY PEACE. STATE EXPERIENCE AND SALARY AND HOW SOON YOU CAN COME. ADDRESS BOX 892, THE IRON TRADE REVIEW, CLEVELAND, O.

Employment

POSITIONS OFFERED
Minimum ad. set solid, 50 words $1.50
Minimum ad. all caps, 50 words $2.00

POSITIONS WANTED
Minimum ad. set solid, 25 words $0.50
Minimum ad. all caps, 25 words $0.75

Positions Offered

PURCHASING AGENT WANTED BY STEEL manufacturer located in western Pennsylvania. Kindly give full particulars, including age, experience and salary expected in first letter. A man familiar with the district and with the manufacture of High Speed Steels preferred. Address Box 886, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—COMPETENT MELTER FOR MALLEABLE iron foundry taking off two heats per day; capacity of air furnace fifteen tons; good working conditions and steady work; location, city in Central West; state experience and wages expected. Address Box 935, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

SUPERINTENDENT MANAGER OR ASSISTANT, able executive with broad successful experience in manufacture of light gray iron. Understand the foundry from core room to finished product. Melt by analysis. Thoroughly trained in accounting, purchasing, production and selling. Can go out and get business. Increased one foundry from 18 to 70 molders and from loss to profit. Can do as much for you. Address Box 949, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY SUPPLY OR EQUIPMENT SALESMAN thorough experienced foundryman desires position selling supplies or equipment. Personally acquainted among the foundrymen of Central States and can get my share of their business. Address Box 950, THE IRON TRADE REVIEW, Cleveland, O.

DUE TO CONDITIONS BEYOND MY CONTROL, which it would appear have blocked me from further advances, I desire to permanently become associated with some other firm. Am employed at present by a large Open Hearth company as Assistant Purchasing agent. Excellent references regarding character and efficiency. Married. Class 4 of 1st draft. Address Box 770, THE IRON TRADE REVIEW, New York.

SALES AGENT OR DISTRICT MANAGER, SOUTH preferred. Ten years' experience with some of the largest wire and bar steel mills; practical knowledge of steel industry. Address Box 848, THE IRON TRADE REVIEW, Cleveland, O.

PORCELAIN ENAMELING. A MAN OF WIDE EXPERIENCE WANTS A JOB TO BUILD OR OPERATE A PLANT. ADDRESS BOX 390, THE IRON TRADE REVIEW, CLEVELAND, O.

Positions Wanted

A-1 COREMAKER FOREMAN WISHES OPPORTUNITY to take charge of Core Department; has excellent ability and reference. Address Box 922, THE IRON TRADE REVIEW, Cleveland, O.

AUDITOR:—HIGH GRADE ACCOUNTANT, COST MAN AND EXECUTIVE. AGE 37, MARRIED, 18 YEARS' EXPERIENCE FOUNDRY AND MANUFACTURING LINES. OPEN FOR IMMEDIATE ENGAGEMENT. ADDRESS BOX 826, THE IRON TRADE REVIEW, CLEVELAND, O.

UNUSUAL OPPORTUNITY
HERE FOR RIGHT COMPANY

I am experienced in steel manufacture in all its elements—a keen practical graduate of metallurgy; with ability to talk convincingly on the subject of steel, particularly alloy steel. My ability as a salesman is secondary to my manufacturing experience, yet I know I can ably and creditably represent a manufacturer of high grade steel in this capacity. I am young, resourceful, ambitious, of good appearance and habits. Have represented the U. S. Government in a capacity requiring the highest type of tact and diplomacy, and I now desire to represent a reputable firm who requires a man of my qualifications and ability. If you have a product that will stand the strictest investigation, and test, write me at once. Address Box 925, THE IRON TRADE REVIEW, CLEVELAND, O.

SUPERINTENDENT

Familiar with steel manufacturers; electric, open-hearth, and bessemer; simple and alloy steel. Practical experience in operation of electric furnaces, heat treating, light and heavy forgings, and steel castings. Capable superintendent of heat treating, inspection, testing, or executive management. At present employed by U. S. Government, Ordnance Department in similar capacity. If interested write at once, outlining duties, and starting salary. Address Box 926, THE IRON TRADE REVIEW, Cleveland, O.

TRAVELING SALESMAN OR SALES MANAGER FOR THE NEW ENGLAND STATES. I WANT TO BECOME ASSOCIATED WITH A LARGE STEEL FOUNDRY REQUIRING THE SERVICES OF A MAN PERSONALLY ACQUAINTED WITH ALMOST EVERY USER OF STEEL CASTINGS IN NEW ENGLAND. TWENTY YEARS EXPERIENCE IN THE MANUFACTURE OF CRUCIBLE, CONVERTER AND OPEN HEARTH CASTINGS. UNDERSTAND ALL PURCHASES REQUIREMENTS. FULL PARTICULARS BY LETTER. ADDRESS BOX 923, THE IRON TRADE REVIEW, CLEVELAND, O.

Positions Wanted

STEEL MAN, TECHNICAL GRADUATE, 12 YEARS' experience and good record. Open for responsible position after January 1st either Open Hearth, Metallurgical or Mill work. Wide experience with Duplex Process. Address Box 932, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—POSITION AS SUPERINTENDENT OR Works Manager of Steel Foundry; 15 years experience in Open Hearth and Electric Steel Castings of all kinds; 40 years old, married. Capable executive. Employed as Superintendent but want bigger field. Address Box 931, THE IRON TRADE REVIEW, Cleveland, O.

WELL EDUCATED YOUNG MAN IN EARLY thirties, with practical steel mill experience and later experienced in Sales and Promotion work in New England and Middle Eastern states, wishes to represent reliable manufacturer in that territory. Salary $3500 and commission. Address Box 934, THE IRON TRADE REVIEW, Cleveland, O.

EMPLOYMENT SUPERVISOR, PLANT SUPT., SHIPPING MANAGER AND OFFICE EXECUTIVE, THOROUGHLY EXPERIENCED IN THE MANUFACTURE OF IRON AND STEEL, WANTS TO LOCATE WITH SOME RELIABLE COMPANY WHERE EFFICIENCY AND RESULTS IS THE THING THAT COUNTS. ADDRESS BOX 948, THE IRON TRADE REVIEW, CLEVELAND, OHIO.

ARTILLERY OFFICER, JUST DISCHARGED, IN service since August, 1917, wants position with Foundry, Machinery, Truck or Tractor plant. College graduate with three years' experience in moulding, melting and shop management, including planning and co-ordinating work of Foundry, machine shop and assembly departments. Central states preferred, and position must have good chances for the future. Address Lock Box 376, Wabash, Indiana.

DRAFTSMAN, SIX YEARS EXPERIENCED, BY-product coke oven construction and maintenance, also experienced in elevating and conveying and coal mining machinery, desires position in similar lines or on blast furnace or steel mill work. Location preferred, east of Detroit. Address Box 943, THE IRON TRADE REVIEW, Cleveland, O.

MARRIED MAN OF 36 WITH 17 YEARS' EX-perience in the operating and accounting departments of offices connected with iron and steel manufacturing concerns, desirous of locating about Cleveland, Ohio. Address Box 941, THE IRON TRADE REVIEW, Cleveland, O.

CONTRACT WORK!!!

Do you know a lot of it is to be had right now?

Start paving the way to bigger business by letting the Fill-In and Contract Work Department of THE IRON TRADE REVIEW serve you.

The readers of THE IRON TRADE REVIEW are just the men you want to interest—the men of big affairs in the iron, steel, foundry, machinery and metal-working industries; the men upon whom falls the responsibility of direction and management.

Why not interest them now?

615

Opportunities

Agencies Wanted and Offered | *Investment of Capital* | *Plants for Sale Lease or Purchase*

Advertising Rates: 1" One Time $3.50; 2" One Time $6.50; 3" One Time $9.50; 4" One Time $12.00.

High Carbon Steel FOR SALE

Immediate shipment from stock.

1¾"	square	x 16 ft.	long	11,980	pounds
2"	"	x 16 ft.	"	6,474	"
2"	"	x 14 ft.	"	37,318	"
2"	"	x 18 ft.	"	5,875	"
2½"	"	x 14 ft.	"	14,280	"
2½"	"	x 12 ft.	"	9,435	"

Railway and Mine Supply Co.
Tel. Harrison 7382
Chicago, Ill.

SET SCREWS ½" and 5/8"

Approximately 20,000 each size.
Length from 1¼ to 3" inclusive.

New stock.

The Ingersoll Milling Machine Co.,
ROCKFORD, ILL.

STRIP STEEL For Sale

Approximately 50 Tons Cold Rolled Strip Steel, from .015 to .156 thick, widths 6", 8", 12¼" and intermediate, all tempers. Also, some wire and Strip Brass. Immediate shipment at approximately Mill prices.

Write or wire

Grand Rapids Brass Company
Grand Rapids, Michigan

WANTED
STEEL AGENCIES

A well established New England Firm desires exclusive agencies for Tool Steel Mill. Cold Drawn Screw Stock and Alloy Steel Mill and Cold Rolled Strip Mill in New England Territory.

Address Box 937
THE IRON TRADE REVIEW, Cleveland, O.

Plates in Stock

ALL NEW MATERIAL
O. H. SHEARED PLATES
TANK QUALITY
3000 Tons in Stock

No. 10—¼", 5/16", 3/8", ½", 7/16", 9/16", 5/8", 11/16", ¾", 13/16", ⅞", 1", 1 1/16", 1⅛", 1 3/16", 1¼", 1⅜", and 1½" thick.
All sizes and Large Plates.

ANGLES.

1½" x 1½" x 3/16" to 6" x 6" x ½" inclusive.
25' to 60' lengths.

CONCRETE REINFORCING
All Sizes—Rounds and Square.

STANDARD BEAMS, CHANNELS, FLATS, BARS, ETC.

T-RAILS.
25 lb., 30 lb., and 40 lb. per yd.

PLAIN MATERIAL SOLD AT STANDARD GOVERNMENT PRICES.

Send us your inquiries.
Let us have your name for our stock lists.

The Republic Structural Iron Works Co.
Warehouse Dept.
1200 E. 53rd St. Cleveland, Ohio.

PIPE

BRITISH THREAD
Sizes ⅛"—4"
400,000 ft.
EX STOCK
New York and Pittsburgh warehouses

WIRE NAILS

Common flat head
3D, 4D, 5D, 10D, 20D, 30D
ex stock
New York Warehouse

A. MORRIS DIXON
22 Whitehall St. New York City

Wanted Agencies

Firm re-opening London (Eng.) Branch Office in charge of Principal, desires Sole Agencies; Steel Works, Foundry, Coke Oven, Railway and Dock Equipment. Principals have connections in Europe and many years' practical and commercial experience. Usual references given and required.

Address Box 946
THE IRON TRADE REVIEW, Cleveland, O.

We have for sale—approximately

100 TONS OF STEEL BARS

in 12 ft. lengths, suitable for heavy reinforce work, and offer same, subject to prior sale, at $2.65 per cwt., f.o.b. cars, L. I. City, N. Y. This material is similar in shape to moulding, is about ⅜" thick and about 1½" in width. Inspection invited.

Midgley & Prentice, Inc.
30 Church St.,
New York City

To Manufacturers of International Vision!

Poughkeepsie, New York, presents one of the best opportunities in the United States as a manufacturing location for export trade development. Freight shipments North and South by the N. Y. C. R. R. and East and West by the C. N. E. R. R. (N. Y., N. H. & H. System); by bridge over the Hudson. Poughkeepsie is 72 miles from New York City giving advantage by water communication on the Hudson River of the greatest port facilities in the world. Electric power as low as 1.5c per K.W. H.; ample labor supply; a $300,000 Industrial Expansion Fund for building purposes. America's gigantic Merchant Marine of 25,000,000 tons is for your use. Locate at Poughkeepsie, New York, and take full advantage of the after the war trade.

Address Chamber of Commerce

Well Established

and rated mill and supply jobbers and

Manufacturers Agents

on Pacific Coast would consider additional lines of **Wood and Iron Working Machinery, Power Equipment, Belting Supplies, Wire Rope, Tool Steel, etc.** Only merchandise that can be unqualifiedly guaranteed considered.

Address Box 893
THE IRON TRADE REVIEW, Cleveland, O.

"Offerings here involving capital bring surprising results"

STEEL

Plates, Structural Straps, Sketch Plates—Other materials

from STOCK

TANK CARS and STORAGE TANKS

For Immediate Delivery

Shippers' Car Line, Inc.
165 Broadway, New York City
Cortlandt 4942

FOR SALE

Open Hearth Flat Steel

200 tons ⅜" thick, 4¾" wide, 83¼ and 84" long
10 tons ⅜" thick 2⅞" wide 84" long
10 tons ⅜" " 2⅞" " 83" "
5 tons ⅜" " 7¼" " 15' "

The B. F. Goodrich Co.
Dept. 37
Akron, O.

Do You Want To Buy an Essential Industry

Consider these LIVE Propositions

3 Story Steel and Brick Construction Building, equipped with 10 Ton Electric Crane.

17,000 sq. ft. of Floor Space. Pennsylvania Siding for 4 cars.

Over $40,000 of modern equipment. Such as lathes, planers, boring mills, radial drills, shapers, millers, etc.

Located in Trenton, N. J.

Now manufacturing large sized Marine Gasoline Engines. Can make them up to 500 H.P.

50,000 sq. ft., brick buildings, for Machine Shop and Foundry —right on N. Y. Central freight yard, in Syracuse, N. Y.

A complete machine shop, foundry, pattern shop, etc., and the name, good will, and established business of a concern with 50 years of national and foreign reputation for building an efficient electric and gasoline driven Centrifugal pump—up to 36".

Now working on unexpired contracts. Orders to be had for the taking. A live service department. Raw and finished stock on hand.

Up-to-date equipment such as boring mills, lathes, radial drills, milling machines, etc.

The Foundry is as complete as can be.

Present organization will stay.

For full details, prices, terms, etc. Write or call.

CHARLES KRISER
Industrial Plants
25 Church Street, New York City

CARBON TOOL STEEL FOR SALE. All Annealed

SUBJECT TO PRIOR SALE — Prices substantially under the market.

Size "Round"	Crescent Extra Carbon 1.00% Base Price 15c	Crescent Carbon 1.02% Base Price 14c	Champion B Carbon 1.00% Base Price 12c	Midvale IX Carbon 1.05% Base Price 20c	Firth Best No. 6 Carbon 1.25% Base Price 20c
¼"	20	140	.....	.....	.....
5/16	50,000	.....	.....	.....	.....
⅜	6,000	.....	.....	.....	.....
7/16	2,000	.....	.....	.....	.....
½	65,000	.....	.....	.....	.....
9/16	15,000	.....	.....	.....	.....
⅝	11,500	.....	9,000	.....	.....
11/16	.....	20,000	.....	.....	.....
¾	3,000	.....	3,300	.....	.....
13/16	6,000	20,000	.....	.....	20,000
⅞	.....	16,000	8,500	20,000	.....
15/16	5,000	2,250	43,700	.....	.....
1	.....	2,400	20,000	.....	.....
1 1/16	.....	1,400	27,000	.....	.....
1⅛	.....	.....	51,500	.....	25,000
1 3/16	46,700	.....	.....	.....	.....
1¼	2,700	2,550	17,000	.....	.....
1 5/16	1,300	.....	20,600	.....	.....
1⅜	3,800	.....	3,750	.....	.....
1 7/16	500	.....	5,800	.....	.....
1½	800	.....	4,400	.....	.....
1⅝	.....	.....	7,100	.....	.....
1 11/16	.....	.....	5,000	.....	.....
1¾	.....	.....	950	.....	.....
1 13/16	.....	.....	51,000	.....	.....
1⅞	2,000	.....	.....	.....	.....
2	.....	.....	1,200	.....	.....
2⅛	.....	.....	4,100	.....	.....
2¼	.....	.....	10,000	.....	.....
2⅜	.....	600	.....	.....	.....
2½	.....	300	.....	.....	.....
2⅝	.....	1,200	.....	.....	.....
2¾	.....	800	700	.....	.....
2 7/8	.....	1,300	.....	.....	.....

TERMS: Net Cash 30 Days, 2% Cash in 10 Days.
PURCHASING DEPARTMENT

The Remington Arms Union Metallic Cartridge Co., Inc.
UMC BRIDGEPORT WORKS Bridgeport, Conn.

WE BUY FOR CASH

for dismantling or manufacturing purposes—plants of any size or description.

P. PETTLER & SON,
Beaver Falls, Pa.
First National Bank Bldg., Pittsburg, Pa.

FOR SALE

New 405 Osborne **Molding Machine** and 8 x 8 Bury **Compressor.** Never used.

Address Box 919
THE IRON TRADE REVIEW, Cleveland, O.

YOU MAY be overlooking a money-saving opportunity if you fail to read the advertisements in this Section each week.

627

Used AND Rebuilt Equipment

For Machine Shops, Foundries, Iron and Steel Works, Mines, Railroads and Metal-Working Plants Generally

Advertising Rates: 1" One Time $3.50; 2" One Time $6.50; 3" One Time $9.50; 4" One Time $12.00.
RATES FOR LARGER SPACE OR LONGER PERIODS FURNISHED ON REQUEST

1876 THE MACHINERY HOUSE OF THE EAST 1918

FRANK TOOMEY, Inc.

MACHINE TOOLS

Lathes

10" x 4 Prentice, H.S. C. R.
12" x 4' Shepherd.
13" x 7' 6" New Carroll-Jamieson plane change.
14" x 6' New Carroll-Jamieson Q.C.
15" x 6' New Sidney Q.C. swings 17".
16" x 7' Niles.
16" x 24' New Rahn Larmon D.B.G. Q.C.
17" x 10' New Sidney Q.C. swing 19".
18" x 6' Robbins.
19" x 8' New Sidney Q.C. swings 21".
19" x 10' New Sidney Q.C. swings 21".
19" x 12' New Sidney Q.C. swings 21".
25" x 16' New Sidney Q.C. swings 27".
28"/48" x 14' Harrington Extension.
33" x 12' Putman T. G. arranged for motor.

Turret Lathes

2" x 24" J. & L. Cone head complete.
24" Davis Chucking.
No. 1 Bardon & Oliver Screw.

Planers

36" x 36" x 8' Gray, two heads.
30" x 27" x 8' Smith, one head.
27" x 23" x 6' Smith, one head.
18" x 8" x 3' Wheeler, one head.

Shapers

7" Rhodes.
16" Smith & Mills.
7—16" New Steptoe B.G.
6—24" New Steptoe B.G.
2—24" New Steptoe B.G.
24" Hendy.
16" Bement Travel head.
16" Barker Travel head.

Millers

No. 4 B. & S. Plain.
No. 3 Cincinnati Universal.
24" x 7½" x 18' Orsterlein Plain with dividing head.
2—No. 1½ New American plain.
No. 0 Steptoe Hand (new).
No. 2 Burke Bench P. F.

Grinders

No. 1 Fraser Universal new.
No. 1 Landis Internal.
No. 6 Coates, new Univ. cutter and reamer.
No. 1 Grand Rapids, new, cutter and reamer.
No. 2 Grand Rapids, new, cutter and reamer.
No. 190 Wells.

Radial Drills

6' Western Univ. motor.
60" Bickford plain.
48" Fosdick plain.
42" New Canedy-Otto.

Drill Presses

14" New U. S. Sensitive.
16" New C. O. Sensitive.
No. 23 New Demco Sensitive.
16" New Kokomo Hi-speed.
20" New Kokomo 4-spindle.
20" Superior B.G., P.F. New.
21" Superior B.G., P.F. New.
24" Superior B.G., P.F. New.
25" Superior S.H. New.
28" Superior S.H. New.
32" Superior S.H. New.
36" Superior S. H. New.
36" Bement, goose neck.
2—D2 Colburn Compound tables.

Vertical Boring Mills

60" Bullard, two heads.
64" Niles, two heads.

Gear Cutters

No. 6 Fellows Gear Shaper.
36" G. & E. Automatic.
24" G. & E. Automatic.
No. 14 Whiton.

Hammers

250-lb. New Little Giant.
100-lb. New Little Giant.
50-lb. New Little Giant.
25-lb. New Little Giant.

Presses

No. 131 Max Ams, New.
No. 126-A Max Ams, New.
No. 121 Max Ams, New.

Punches and Shears

No. 53 Beloit, New Punch and Shear.
No. 54 Beloit, New Punch and Shear.
No. 9B Beloit, New Punch and Shear.
No. 27 Beloit, New Splitting Shear.
20" Throat Ridgeway geared single end punch 1½" in 1".

Metal Saws

Napier 10 x 10 band.
Napier 13" x 16" Hi-speed.
Napier 9 x 9 Hi-speed.
Napier 6 x 6 Hi-speed.
Economy No. 3.
Espen-Lucas 14" saw, bar, circular.

Miscellaneous

National 5-spindle ¼ to ¾ Nut Taper.
Cleveland 4" x 15 Thread Miller.
Chucks, Univ. combination and independent 6" to 24".

FRANK TOOMEY, Inc.

127-129-131 North 3rd Street Philadelphia, Pa.

GUARANTEED MACHINERY

Partial Selection from Our Stock for Immediate Delivery

HAMMERS

One—8000-lb. Erie Steam.
One—3000-lb. Erie Steam.
One—3000-lb. Buffalo Steam.
One—2000-lb. Chambersburg Steam.
One—1200-lb. Massillon Steam.
One—800-lb. Massillon Steam.

LATHES

One—50″x30′ bed Quick Change–triple geared.
Four—36″x12′ Putnam Quick Change Heavy Duty.
One—36″x22′ Betts, complete.
One—30″x16′ Niles Triple Back Geared—compound rest.
Two—24″x12′ Prentiss, complete.
One—24″x14′ Fifield, complete.
One—22″x12′ New Haven, complete.
One—21″x36″x16′ LeBlond Heavy Duty Quick Change.
One—21″x10′ Flather—Quick Change—Taper Attachment.
One—20″x10′ Lodge & Shipley—compound rest—taper attachment.
One—20″x10′ American—Quick Change.
One—20″x9′ Shepard—compound rest—Quick Change.
One—20″x12′ Blaisdell.
One—16″x8′ Prentiss.
One—16″x8′ Carroll-Jamison—compound rest—Quick Change.
One—14″x6′ Lodge & Shipley—Quick Change.

PLANERS

One—24x24x6′ Table Rochester—single head.
One—48x36x10′ Table Ohio—two heads.
One—42x42x12′ Table Pond—two heads.
One—48x48x16′ Detrick & Harvey Open-side—one rail head.
One—48x48x24′ Eames—four heads.
One—42x42x12′ Open-side—One rail head—one side head.
One—60x60x12′ Sellers—Two rail heads—one side head.
One—78x52x14′ Young-Farrell—Two Heads.
One—100x48x16′ Sellers—Four Heads—Swivel geared drive.

PUNCHES AND SHEARS

One—No. 5 Long & Alstatter Double-end Punch and Shear.
One—No. 2 Royersford Double-end.
One—Wais & Roas—heavy duty—double end.
One—Rock River—36″ single end punch.
One—Rock River—42″ Throat—single end punch.
One—No. 4 Long & Alstatter Splitting Shear.
One—Model B-5 United Foundry Alligator Shear.
One—Newbold Circular Shear—capable of cutting 60″ circles—1½″ material.

POWER PRESSES

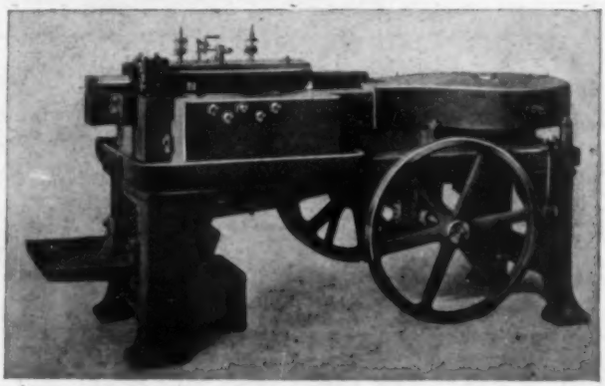
One—3¾ A Bliss Toggle Press.
One—3½ A Bliss Toggle Press.
Ten—No. 52 Ferracute Coining Presses—1½″ stroke.
One—No. 21 B Bliss Inclinable.
One—No. 19 Bliss Inclinable.
Three—No. 18 Bliss Inclinable.
One—Farrell Foundry Stiles Punch Press—equal to No. 4 Bliss Stiles.
One—Farrell Foundry Double Cam 36″.

RADIAL DRILLS

One—6′ Bausch Plain—single pulley drive.
One—5½″ Niles—Plain—cone driven.
One—5′ Cincinnati full universal.
One—4′ Warren—semi-universal—motor driven.
One—3½′ Canedy-Otto Plain—cone driven.
One—3½′ Morris Plain—single pulley drive.
One—3′ Morris Plain—single pulley drive.
One—3′ Hilburt Plain—single pulley drive.
Three—36″ Back-geared—Sliding Head Drill Presses.

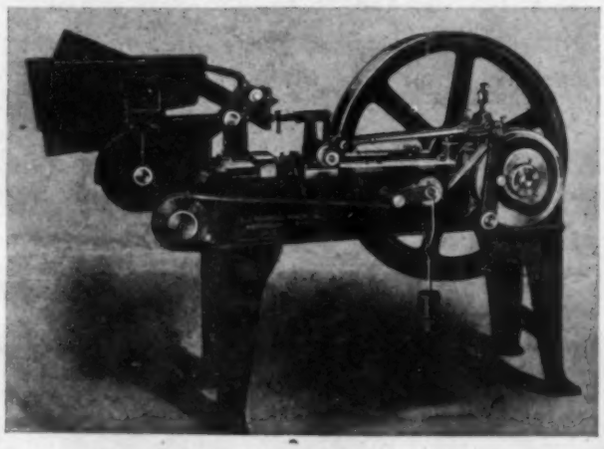
SPECIAL

We have twenty of these BOLT machines for immediate delivery, which we will let go at bargain prices, condition guaranteed equal to new. Specifications under individual machine.



MANVILLE No. 4
SCREW THREAD ROLLERS

Largest diameter of screw	¾ in.
Greatest length on thread	3⅜ in.
Length of dies	9 in.
Stroke of moving die	20 in.
Ratio of back gearing	1 to 12
Size of T. & L. Pulleys	28 x 5 in.
Weight with hand feed	5300 lbs.



NO. 3 MANVILLE
BOLT TRIMMERS

Machine Number—3	Drawing Number—1526
Largest Blanks Handled	⅜ in.
Longest Blanks Handled	4½ in.
Shortest Blanks Handled	¾ in.
Stroke of Punch	5 in.
Diameter of Shaft	3¼ in.
Diameter of Wheel	44 in.
Face of Wheel	5¼ in.
Weight of Wheel	500 lbs.
Speed per Minute	50 to 60
Weight of Machines	3300 lbs.
Floor Space	33 x 92

Immediate action is solicited. Write, wire or 'phone us.

MODERN MACHINERY EXCHANGE

25 Church Street NEW YORK CITY

BIGGEST ::: BEST

The Machinery Exposition of U. S. A.

HAMMERS

250-TON MESTA STEAM HYDRAULIC QUICK ACTING FORGING PRESS, single frame type, weighs 50,000 lbs.
1500-lb. Bliss board drop.
1500-lb. United Engr. Co.'s board drop.
500-lb. Mossberg, automatic drop, strap type.

VERTICAL BORING MILLS

14' Standard, 2 swivel heads.
10' Hilles & Jones, single swivel head.
90" Pond, 2 swivel heads.
52" Bridgeport Bullard, 2 swivel heads.
36" Baush, 2 swivel heads.
36" Bullard, 2 swivel heads.
30" Bullard, single turret head.

LATHES

52" x 22' Wood Light, triple geared, face plate drive.
50" x 20' Pond, triple geared, face plate drive.
38" x 14' Fay & Scott, heavy duty, 3" hole in spindle.
30" x 12' Israel Johnson, heavy duty, triple geared, face plate drive.
28" x 12' Fay & Scott.
20" x 8' Lodge & Shipley, geared head, single pulley drive.

PLANERS

60" x 48" x 20' Gleason, 2 swivel heads on cross rail, one side head.
48" x 36" x 16' Detrick & Harvey, open side, three heads.
48" x 36" x 13' Detrick & Harvey, open side, three heads.
48" x 36" x 10' Ohio, 2 heads.
36" x 36" x 14' Cincinnati, 2 heads.
30" x 30" x 14' Flather, 2 heads.

GEAR CUTTERS

48" Gould & Eberhardt, spur.
36" Gould & Eberhardt, spur and bevel.
Two (2) No. 3 Fellows Gear Shapers, 24" cap.

RADIAL DRILLS

6' Baush, box table.
6' Bickford, box table.
5' Baush, motor driven.
5½' Niles, semi-universal.
3½' Gang, tapping box table.

HORIZONTAL BORING MILLS

No. 2 Barrett Cylinder Boring 5" bar.
3" Industrial, knee type.
3" Rochester, floor type.

POWER PRESSES—DOUBLE ACTION

No. 512 Bliss, 33 tons working pressure.
Two (2) No. 3½ Bliss Toggle Drawing, approx. weight 16,200 lbs.
Two (2) No. DD-4 Ferracute, throat 9", approx. weight 6,000 lbs.
Two (2) No. 3½ Farrell, geared toggle, 4" stroke.

PRESSES—SINGLE ACTING

Six (6) No. 540 Max Ams, geared, 8" stroke, weight 5,600 lbs.
Six (6) No. 6 Farrell, straight side, geared.
Two (2) No. 6 Farrell, geared, 5" stroke.
No. 5 Farrell, geared, 8" stroke.

PUNCHES AND SHEARS

No. 7 Hilles & Jones Multiplex Punch, approx. weight 50,000 lbs., easily converted to shear.
No. 61 Thomas Carlins, Alligater Shear, 30" shear blades, capacity 5" round.
Betts Punch, depth of gap 20". Capacity 1" thru 1".
19" Gap Cleveland Punch, capacity ¾" x ¾".
No. 2 Royersford Combination Punch and Shear.
Newbold Rotary Splitting Shear, cap. ¾", throat 28", circular cutting attachment.

NOTE: We have just purchased sixty (60) presses—almost new, single and double acting, forming and blanking. Send for full particulars.
The above are merely selections at random from over five hundred (500) machines at our warehouse, ready for immediate delivery.

GRAVES MACHINERY EXCHANGE

Warehouse and R. R. Siding,
Johnson Ave. and Monitor St., Jersey City, N. J. **Telephone Cortlandt 665**
Offices
Suite 482, 50 Church St., New York City

USED MACHINERY—NEW CONDITION

Just a few of the numerous machine tools at our warehouse.
Wire, write or phone your needs.

1—No. 3 **Wilmarth & Morman Surface Grinder,** new.

1—2" **Cleveland Automatic Screw Machine,** magazine feed, late type.

1—24" **Gould & Eberhard Shaper,** back-geared.

1—No. 4 **Styles** back-geared **power press.**

1—No. 1 **Wilmarth & Morman Universal Grinder,** new, complete.

1—36" **Bridgeport Boring Mill,** two heads, all geared feeds.

1—**Chambersburg** 2000 lbs. single frame **Steam Hammer,** off set type.

1—12 x 48 **Modern Self Contained Grinder.**

3—**New Greenfield Universal Grinders.**

1—24" **Smith & Mills Rack Shaper,** in excellent condition.

1—16" **Hamilton Shaper,** single pulley drive, in excellent condition.

6—18 x 8 **Superior Lathes,** double back-geared, quick change gears, just like new.

1—**Morton Traveling Head Slotter,** bed plate 15' x 18', actual length of ram 6', 4½' under rail, about 12' longitudinal travel of head on rail, power feed to housings and rail full length of bed plate, motor driven.

AMERICAN MACHINERY EXCHANGE, INC.

ENTIRE PLANTS BOUGHT AND SOLD

219 Centre Street **New York City**

GUARANTEED 95% NEW

The following twelve machines used only for a short time and guaranteed as above:

2–No. 56 National Acme four-spindle Automatics.

2½ in. Cleveland type A Automatic.

6–No. 3½ Van Norman Radial Grinders.
2–No. 34 Van Norman Internal Grinders.
18-in. Heald Rotary Surface Grinder with Magnetic Chuck.

From our regular stock we can offer the following:

LATHES

50-in. x 20-ft. Fitchburg, triple geared.
26-in. x 14-ft. Putnam, heavy duty, Q.C.G., D.B.G.
2—25-in. x 12-ft. Le Blond, heavy duty, Q.C.G., D.B.G., taper attachment.
30-in. Furrier Pulley Lathe, double C.R.
20-in. x 8-ft. Mueller, Q.C.G., D.B.G.
16-in. x 8-ft. Whitcomb-Blaisdell, Q.C.G., taper attachment.
16-in. x 8-ft. Philsmith, Q.C.G., taper attachment, draw-in collets and pan bed (new).
16-in. x 8-ft. Philsmith, Q.C.G. (new).
14-in. x 8-ft. Hendey, Q.C.G.
14-in. x 6-ft. Canedy-Otto (new).
14-in. x 8-ft. Philsmith, Q.C.G., taper attachment. draw-in collets and pan bed (new).
14-in. x 6-ft. Philsmith, Q.C.G. (new).

MILLING MACHINES

No. 2 Cincinnati Universal (new).
No. 2A B.G. Garvin Universal.
No. 2 Brown & Sharpe Plain.
2—No. 21 B.G. Garvin Plain.
2—No. 15 B.G. Garvin Plain.
2—No. 14 B.G. Garvin Plain.
No. 14A B.G. Garvin Plain.
3—No. 26 Becker Plain.
2—No. 25 B.G. Becker Plain
Ingersol, Planer type Miller.

GRINDERS

No. 2 Brown & Sharpe Universal.
No. 4 Cincinnati Universal 16-in. x 72-in.
10 x 50-in. Norton Cylindrical Grinder.
10 x 42-in. Landis Cylindrical Grinder.
No. 1 Grand Rapids Universal (new).
3-spindle Bryant Chucking Grinder.
2—Ford Smith Shell Grinders.
2—LeBlond Universal Grinders.

DRILLS

6-spindle Foote-Burt Drill (heavy type).
3-spindle Foote-Burt Drill (heavy type).
12—20-in. B.G. Canedy-Otto Drills (new).
15—14-in. Myers Drills (new).
20—10-in. Myers Drills (new).
20-in. B.G. Barnes Drill sliding-head.

POWER PRESSES

Ferracute straight sided geared.
No. 52 Niagara Geared Arch.
No. 4 Niagara Inclinable.
No. 3 Toledo Inclinable.
2—Crosby Straight Sided.
5—No. 7 American Straight Sided B.G.
2—800-ton Hydraulic Presses.

TURRET AND SCREW MACHINES

½-in. Cleveland Model A Automatic.
½-in. Cleveland Model B Automatic.
3—No. 2 B. & S. Full Automatics.

SHAPERS

36-in. Morton draw-cut, vise, c/shaft.
24-in. Ohio Shaper and c/shaft.
24-in. Smith & Mills Shaper, c/shaft.
24-in. Lodge & Davis Shaper, c/shaft.
18-in. Hendey Shaper, vise, c/shaft.

MISCELLANEOUS

36-in. Fellows Gear Shaper.
3—Detroit Electric Spot Welders, 220 Volt, 60 cycle.
No. 00 Baker Keyseater.
Collier Smith "Quickwork" Shear.
Collier Smith "Quickwork" Beader.
No. 14 Besly Disc Grinder.
No. 08 Niagara deep throat Shear.
Badger Saw Table.
American two-spindle Shaper.
American single spindle Shaper.
48-in. Squaring Shear.

Large stock of other equipment—Hacksaws, Drills, Motors, etc.

NEW JERSEY MACHINERY EXCHANGE

No. 21-23 Mechanic Street, NEWARK, N. J.

Rails

130 ton 70 lb. Relaying Rail.
40 ton 40 lb. Relaying Rail.
350 ton 35 lb. Relaying Rail.
80 ton 25 lb. Relaying Rail.
60 ton 20 lb. Relaying Rail.
15 ton 16 lb. Relaying Rail.
10 ton 12 lb. Relaying Rail.

Punches and Shears

1—Heavy duty gate shear with 21" blade, 11" throat, cap. cutting up to 1½" plates, spur gear 42" dia. by 10" face.
1—Single end shear, 22" throat.
1—Lennox Rotary bevel shear, ¾" plate.
1—Alligator shear for 1½".
1—Alligator shear for 2".
1—Alligator shear for 2½".
Wiener steel plate "I" beam shear
Single end punch, 27" throat, ¾" thru ¾" plate.
1—12' Boilermakers' plate flanging clamps.

Plate Bending Rolls

1—12' Niles plate bending roll; upper roll 17" lower roll 13" pyramid type; drop end housings; power elevating; belt driven, for ¾" plate.
Angle iron bending rolls for 4 x 4 x ½" angles.
1—8' Hand Power roll, ½" cap., 6 lower 10' upper.
1—10' Plate bending roll for ¼" plate.

Rolling Mill Stand

1—New rolling mill stand for finishing ends. 72" plate mill, 2 rolls high, 24" dia. by 72". Arranged for direct connection.
1—16" rolling mill, 3 rolls high, two stand, direct connected to a steam engine.
1—Stand, 2 rolls high, belt driven finishing mill.

Hydraulic Riveting Outfit

1—Chambersburg 150-ton Hydraulic Riveting Outfit, consisting of 1 hydraulic riveter, 12' 8" gap with pump, hydraulic hoist, crane, accumulator and container.
1—16 ft. Gap Riveter.
1—12 ft. Gap Riveter.
1—10 ft. Gap Riveter.

Boilers

7—250 H.P. Cahall vertical boilers, Rooney stoker 160 lbs. pressure.
2—360 H.P. Atlas water tube; 150 lbs. pressure.
2—150 H.P. Scotch Marine; 125 lbs. pressure.
5—100 H.P. Marine; 100 lbs. pressure.
2—80 H.P. Firebox; 90 lbs. pressure.
4—72x18' triple riveted; butt strapped; 125 lbs. pressure.
2—66x16' triple riveted; butt strapped; 125 lbs. pressure.

Complete Power Plant

4—72x18' triple riveted; butt strapped boilers with Sturtevant mechanical draft coal handling and weighing apparatus.

Fire Brick

300,000 Fire Brick—Common—Silica—Christy—St. Louis and Buck-eye, Indiana Shipment.

Cable

500,000 ft. of Cable; Sizes from ¼" to 2 in.

Coil Chain

A large quantity of Coil Chain in all sizes up to 1½ in.

Steel Tanks

6—10,000 gal. horizontal storage tanks.
2—8,500 gal. vertical storage tanks.
2—7,200 gal. horizontal storage tanks.
2—2,500 gal. horizontal car tanks.

Steel Buildings

1—Steel building, 41' 6" clear span, 80x10'.
1—Steel building, 42' 4" clear span; 100x30'.
1—Steel building, 75' clear span; 175'x25'.
1—Steel building, 50' clear span, 352' long 30'; equipped with 15 ton, 4 motor crane, 5 ton auxiliary hoist D.C.
1—Steel frame building, 78' clear span, 100x30' long.

Our Machinery Bulletin 17R-508 mailed on request.

HARRIS BROS. CO.

CHICAGO, ILL.

CORLISS ENGINES

28 x 48 Wetherill	22 x 42 Frick
16 x 36 Wetherill	18 x 42 Hamilton
14 x 36 Wetherill	10 x 20 Hamilton

Power Equipment Company, Engrs.
1218 Chestnut Street Philadelphia, Pa.

FOR SALE
30" Cupola

42" O. D. 30" Ins. D. 60" diameter air chamber high 40 ft.

FAIRMONT MINING MACHINERY CO.
FAIRMONT, W. VA.

YOU MAY BE OVERlooking a money-saving opportunity if you fail to read the advertisements in this Section each week.

841

FOR SALE
Available for Prompt Shipment

1—New 9"x14" horizontal double acting Worthington Air Compressor with Laidlaw-Dunn-Gordon Feather Valves.
1—New 12"x12" Hill Air Compressor, 10-12-lb. Pressure.
1—New 22"x48" horizontal Rolling Mill Type Corliss Engine, Double Eccentric.
1—Used 15"x30" horizontal Rolling Mill Type Corliss Engine, Double Eccentric.
3—New 6"x6" vertical Engines, 6-8 H.P.
1—Used 7½"x8" Vertical Engine, 10 H.P.
1—Used 6"x60"x14' horizontal Motor Driven cylinder boring and facing machine.
8—Used Pipe cutting and threading machines of various sizes.
1—Used Solid Die Stock, maximum 7".
1—Used Emery Wheel Stand for 24"x2" wheel.
Our prices will interest you.

THE VILTER MFG. CO.
1006 Clinton St. Milwaukee, Wis.

RIVERSIDE MACHINERY DEPOT

NEW LATHES

1—24x12 Springfield Ideal Engine, 3-step D.B.G.
1—18x8 Springfield Ideal Engine, all geared, S.P.D.
1—16x6 Filsmith qk-chge Engine, 3-step D.B.G.
1—14x6 Filsmith qk-chge Engine, 3-step D.B.G.
2—Adams Short Cut Lathes complete with pumps.

New Shapers, Milling Machines & Grinders

2—16" Springfield Back G. Crank Shapers.
1—25" Springfield B.G. Crank Shaper.
3—20" Milwaukee B.G. Crank Shapers.
2—24" Milwaukee B.G. Crank Shapers.
1—20" Columbia B.G. Crank Shaper.
1—No. 1 Dow Plain B.G. Miller.
2—No. 0 B. Fox Plain Millers complete.
3—No. 1 U. S. Hand Milling Machines.
1—No. 2½ Woods Universal Grinder.
1—No. 1 Thompson cutter and reamer grinder.

NEW DRILL PRESSES

3—20" Champion Drill Presses B.G. P.F.A.S. No. 4 N. T.
2—14" Champion Bevel Gear Drive Floor Drills.
4—No. 1 and 2 Detroit Semi Automatic Hor. Drillers 5 spindle.
2—3½' Canedy-Otto Radials, floor type.
2—20" Milwaukee lever feed Drill Presses.
3—20" Milwaukee W. & L. feed Drill Presses.
2—14" Excelsior Sensitive Drills.
2—No. 22 Demco H. S. B. B. Drills.
1—No. 32D Demco Floor Type Drill.
1—No. 31B Demco H. S. B.B. Drill.

USED ENGINE LATHES

1—28" Niles Rigid Turret.
1—Lo-swing Lathe.
1—14"x6' Porter Lathe.
1—15"x6' Porter 5-step S.B.G.
1—16"x8' L. & S. qk-chge. box, S.B.G.
1—20"x12' All Geared S.P.D. W. & S.
1—28x14' Fay & Scott Engine Lathe.
1—24x12' Perkins Engine Lathe.

NEW POWER PRESSES

1—50-lb. Mayer Upright Hammer.
1—25-lb. Mayer Upright Hammer.

NEW SAWS

2—No. 4 Marvel High-speed Hack Saws.

USED TURRET MACHINERY

1—18"x6' Fox Monitor Lathe, Springfield.
2—3x36 J & L Turret Lathe, sgle spdle.
1—4¼" Gridley sgle spdle auto. screw machine.
2—No. 3 Smurr & Kamen Hand Screw Mches.
2—2" Cleveland Automatic Screw.
2—No. 107 Wells Hand Screw Machines.
1—⅝"x5¼" Cleveland auto. Screw Machine.
5—No. 52 Nat. Acme 4-spindle auto.
1—No. 53 Nat. Acme 4-spindle auto.
1—No. 515 Nat. Acme 4-spindle auto.

USED GRINDERS

1—No. 60 Heald Cylinder Grinder.
1—No. 6 Bryant Internal Grinder.
1—No. 10 Bryant Internal Grinder.
1—No. 1 Landis Internal Grinder.
1—No. 20 Cylindrical Grinder.

USED GEAR CUTTERS

1—No. 6 Fellows Gear Shaper.
1—No. 3-36 B. & S. Auto. Spur Gear.
1—No. 3-26 B. & S. Auto. Spur Gear.

USED PLANERS, SHAPERS, MILLERS

1—44"x24"x11' Lincoln O. S. 2 head stone.
1—46"x40"x13' O. S. Patch 2 head stone.
1—48"x13" Bedford O. S. 2 head stone.
1—32"x43"x13' Patch O. S. 2 head stone.
2—14" Hendy Friction Shapers.
1—60" Bickford Vert. Bor'g Mche. 1 head.
1—W & S 2-spindle Valve Miller.
2—No. 2 P. & W. Die Sinkers, single spindle.
1—3" Fosdick Horiz. Bor'g Mill, like new.
1—3½" B. & S. Horiz. Bor'g Mill, like new.

USED DRILL PRESSES

1—4-spindle Moline Cyl. Bor'g Machine, adj. spindles.
1—2-spindle Baker H. D. Drill.
1—16-spindle Natco Drill.
1—12-spindle P. & W. Drill.
1—14" H. & W. H. Speed B. B.
1—4-spindle Fox Sensitive.
1—4-spindle Foote-Burt Sensitive.
1—No. 1 Garvin Tapper.

USED PUNCH PRESSES

1—No. 19 Bliss O.B.I. Plain Press.
1—No. 4 Niagara O.B.I. Press.
1—No. 0 Plain O.B.I. Press, Consolidated.
1—1½ Consolidated Plain O.B.I. Press.
1—No. 52 Toledo Arch Press.
1—No. 39 Bliss Horning Press.
1—No. 267 Consolidated Press, 45,000-lb.
1—18,000-lb. Waterbury-Farrel S. S. trimm'g press, geared with side shear.

USED STEAM ENGINES

1—15x20 Russell R.H. auto girder frame.
1—10x15" Buckeye auto, horiz.
1—13½x16 Taylor automatic.
1—10x18 Brownell R. H. automatic.
New Squirrel cage induction motors—3-phase, 60 cycle, 220 volts, from 1 to 40 h.p. in stock.

HEAT TREATED EQUIPMENT

1—New No. 12 Eagle Carbon Steel Furnace.
1—New No. 14 Eagle Carbon Steel Furnace.
1—New No. 20 Eagle High Speed Furnace.
1—No. 5A Used Frankfort Furnace.
1—No. 0 Used Stewart Lead Hardening Furnace.
1—No. 3A Used Bellevue Carbon Steel Furnace.
2—New No. 35 Connersville Pressure Blowers.
2—New No. 40 Connersville Pressure Blowers.
1—New No. 50 Connersville Pressure Blower.
1—New No. 60 Connersville Pressure Blower.
Complete Brown H. R. High Resistance Pyrometer equipment, complete with recorder.

We also carry in stock Steam Pumps, Electrical Equipment, and are in the market to purchase equipment of all kinds. We have just completed arrangements with a well known furnace engineer, enabling us to take care of your Heat Treating requirements at prices that are right and early delivery and solicit your future inquiries in that line.

Riverside Machinery Depot, 25 ST. AUBIN AVE., DETROIT, MICH.
Telephone—Edgewood 1582

Machinery and Equipment

LATHES

48" Niles Car Wheel Lathe Motor Driven.
48" x 16' Turning Lathe, C.R., Sgl. Gear.
38" x 25' New Haven, raised to swing 56".
30" x 14' LeBlonde, C.R.
24" x 12' Lodge & Shipley, H.S., C.R.
30" x 12' Prentice, H.S., C.R.
18" x 8' Lodge & Shipley, H.S., C.R. (2)
16" x 10' Sebastian, H.S., C.R.
16" x 6' Blaisdell, H.S.
14" x 5' American Speed Lathe, Hand Rest.
16" x 5' Jones-Lamson Turret Lathe.
34" x 11' American Semi-Automatic Turret Lathe.

PLANERS—MILLERS

24" x 24" x 6' Lodge & Davis Planer, 1 head.
24" x 24" x 8' Chandler Planer, one head.
26" x 26" x 74" Pond Planer, one head.
30" x 30" x 10' American Planer, one head.
48" x 48" x 20' Gray Planer, four heads.
72" x 48" x 16' Pond Mch. Tool Co. Planer, 2 heads.
80" x 72" x 20' Thurston-Gardner Planer, one head.
No. 2 Brown & Sharpe Plain Milling Machine.

DRILLS—BORING MILLS

No. O and I (New) Burke Sensitive Bench Drills.
14" Woodward & Rogers Sensitive Bench Drills.
10" D. Slate Sensitive Drill on Column.
No. 3 Prentice Portable Rope Drive Drills.
No. 22 (New) Silver Hand Power Post Drills.
20" (New) Silver Drills, Plain and Bk. Gd.
20" Foote-Burt Manufacturers Drill.
24" New Haven Plain Drill.
28" Cincinnati Drill, Sliding Head, B. G.
36" Gould-Eberhardt Drill, Tap. Attach.
Garvin 4 Spindle Drill, No. 3 Taper.
4' Fosdick Plain Radial Drill, Tap. Attach.
4½' Bickford Plain Radial Drill, Tap. Attach.
48" Niles Car Wheel Boring Mill.

PUNCHES—SHEARS—PRESSES

No. 8 Long & Alstatter Sgl. End. 3½" Throat.
No. 1-O Doty Punch and Shear, 9" Throat.
12" Throat Single End Shear, cap. ½".
12" Throat Double End Punch and Shear, 1" x 1".
50" Throat Reade Sgl. End Punch and Shear. 1¼"x1".
Bliss 18" Throat Geared Slitting Shear.
Perkins 12" Throat Slitting Shear, 18 Ga.
Badger Alligator Shear, cap. ½" x 3" flat.
No. 56 Dbl. Housing Power Press, 24" width.
No. 3½ Greenerd Arbor Press for bench.
Stevenson No. 4 Foot Press, 6" Throat.
Niagara No. 24 Hand Punch, 15" Throat.
Horning Press, Foot Power.

PRESSES

No. 59¼ Toledo Drawing Press (2).

ROLL LATHE

Mesta 26" Roll Lathe, Bed about 19' long. Two Necking Rests.

LATHE

Fifield Triple Geared Engine Lathe 46" swing, 21' 6" bed.

HAMMERS—BULLDOZERS

1100 lb. Morgan Single Leg Steam Hammer.
7000 lb. Morgan Dbl. Leg Steam Hammer.
No. 5 Williams & White Bulldozer.
No. 6 Williams & White Bulldozer.

MISCELLANEOUS

Curtis 6" Pipe Machine, Engine Driven.
1½" Kenyon Bolt Cutter.
No. 2 Baker Keyseater, range 18" x 2".
Gliem Cold Saw, 22" Dia. Cap. 6" Rd.
Newton Cold Saw 20" Dia. Cap. 1¼" Rd.
Badger No. 5 Rip and Cut-off Saw. 30 x 38"
10" Dbl. End Emery Grinder on Column.
Diamond 12" Dbl. End Bench Grinder.
Russell 12" Dbl. End Bench Grinder.
Lancaster 16" Dbl. End Emery Grinder.
Barnes 20" Wet Tool Grinder.
20" Ransom 250 Volt D.C., Wet Tool Grinder.
Diamond No. 2 Polishing Stand, 36" Arbor.
Dbl. End Polishing Stand, 42" x ¾" Arbor.
Cuyahoga Dbl. End Polishing Stand, 18" x 1¼".
Air Compressor, Sgl. Cyl. 3 x 5" belted.
Air Compressor Dbl. Cyl. 2½ x 4" belted.
Air Compressor, Laidlaw-Dunn Gordon, Hor 6" x 6", B.D.
Blaisdell Sgl. Cyl. Horiz. Air Comp. 81 ft.
Wilson-Snyder Steam Pump, 4 x 2½ x 6".
Roberts Duplex Steam Pump, 5½ x 4 x 6".
Hall Duplex Steam Pump, 6 x 7 x 8".
Van Wie No. 6 Centrifugal Pump, 6" dia.
Deming No. 604 Force Pump, 4 x 4½.
Triple Hand Punch, ½", ⅝", ¾" punches.
Startevant No. 0 Pres. Blower, 3½" outlet.
Connersville Rotary Pres. Blower, cap. 24'.
Brazing table, 17" x 29½", Gas Tank.
10-Ton Pawling & Harnischfeger 3-Moter Traveling Crane 60' Span, 220 Volt, D. C., Fish Belly Girder.

ENGINES—BOILERS

5' x 5" Erie Vertical Steam Engine.
8" x 8" Lane Horizontal Steam Engine.
4 H.P. Fowler Vertical Gas Engine.
40 H.P. Backus Horizontal Gas Engine.
50 H.P. Middleton Horizontal Gas Engine.
6 H.P. Sgl. Flue Vertical Boiler.
60 H.P. Vert. Submerged Tube Boiler.
30 H.P. Vertical Tubular Boiler.
50 H.P. Vertical Tubular Boiler.
150 H.P. Horizontal Tubular Boiler, 72" x 18.

RUSSELL MACHINE CO., 28th and A. V. Ry., Pittsburgh, Pa.

"RELIABUILT"

ONE PROFIT—QUICK DELIVERY—AS REPRESENTED

WATCH THIS PAGE

Millers

1—Used No. 2 Cincinnati Plain Miller, cone pulley drive, same as new.
1—NEW No. 3-H LeBlond Universal Miller.
1—Used No. 4 Cincinnati Plain Miller arranged for motor.
1—Used No. 33 Becker-Brainard Miller.
20—New No. 1 Bickford Hand Miller.
20—New No. 13 Garvin Millers, Plain.
1—New No. 3 Kempsmith Vertical Attachment.
4—New No. 4 American Plain Millers.
6—New No. 1½ Valley City Plain Millers.
19—New No. 1½ Valley City Universal Millers.

Grinders

1—New Style BX Wilmarth & Morman Universal.
1—New 18" Hoysradt Disc Grinder.
2—Used Walker Precision Hood Grinders.
1—Used No. 5 Brown-Sharpe Universal.
1—Used 20" Cylindrical Grinder.
5—New Dumore Electric Grinders.
New Premier Tool and Cutter Grinders.
1—New No. 3 Self-Contained Countershaft Grinding Machine.
1—New No. 4 Self-Contained Countershaft Grinding Machine.
1—New No. 5 Self-Contained Countershaft Grinding Machine.

Planers

1—Used 25 x 25 x 6 Sellers.
1—Used 22" x 22" x 5½" Wheeler Planer.
1—Used 24" x 24" x 5½" Lathe-Morse, one head.
1—Used 36"-48" x 36" x 12' 6 New Haven Extension.
1—Used 38" x 38" x 8' 6 Planer, one side, one rail head.
1—Reliabuilt 38 x 38 x 12'-6" with three heads.
1—Reliabuilt 42" x 42" x 12' Openside Planer, all power feeds, one rail, one side head.
1—Model B 42" x 42" x 12' Open Side Planer, all power feeds, one rail head.
1—New 42" x 42" x 12' Open Side Planer, one rail head, one side head, all power feeds.
1—Reliabuilt 60" x 48" x 13' Lincoln, Sellers Spiral Gear Drive, 4 heads, power feeds all directions.
1—Reliabuilt 60" x 60" x 12' Sellers Planer, two heads on rail, one side head.
1—Reliabuilt 66" x 52" x 13' 6 Planer, two heads, complete, power feeds.
1—Used 73" x 48" x 13' Lincoln Planer, Sellers Spiral Gear Drive, four heads, power feeds all directions.
1—Reliabuilt 74" x 52" x 14' Planer, two heads, complete.
1—Reliabuilt 78" x 52" x 14' Planer, two heads, complete.
1—Reliabuilt 100" x 48" x 16' Lincoln Sellers Spiral Gear Drive, four heads, power feeds all directions, complete.
1—14' Hilles-Jones Plate Planer, excellent condition.

Lathes

1—Used 14 x 5 Putnam.
1—Used 14 x 8 Perkins.
10—New 14 x 6 Walcott.
1—Used 16 x 6 Robbins.
22—Used 18 x 8 LeBlonde Double Back Geared, Quick Change.
100—Used 20 x 8 American Double Gack Geared, Quick Change.
1—Used 28 x 12 Boye-Emmes Lathes.
1—Used 30 x 14 Pond Lathe.
1—Used 34 x 18 Pond Lathe, Triple Geared.
3—New Keystone Lathes, 13" swing, 8" over carriage, 3' between centers, 3 step cone, pulleys, double back geared, complete.
2—Used 16" x 8' Greaves-Klusman Lathes.
1—Used 16" x 8' Schellenbeck Lathe.
1—Used 18" x 6' American Lathe.
1—Used 18" x 6' Reed Lathe.
1—Used 18" x 8' Prentice Lathe.
1—Used 20" x 8' Fitchburg Lathe.
1—Used 20" x 8' Pond Lathe.
1—Used 24" x 10' Harrington Lathe.
1—Used 25" x 8' Reed Lathe.
5—New 25" Sidney Engine Lathes, from 16' to 24' bed.
1—Used 26" x 8' Reed Lathe.
1—Used 30" English Lathe, complete.
1—Used 38" x 14' D. W. Pond Lathe.
2—2½ x 36" Marvel Geared Head Lathes.

Radial Drills

11—NEW Aurora 24" Drills, with tapping attachment.
1—Used 3' Dreses Plain Radial Drill, extra Plain box table.
9—Used Moline "Hole Hog" Drills, 10½" column to spindle, 33½" spindle to table when down, complete.
1—Used 7' Warren Semi-Universal Drill.
1—Used 24" Aurora Sliding Head Drill.
1—Foote-Burt Eight Spindle Drill.
3—New No. 1 Burke Drills.
3—Used No. 310 Baker Heavy Duty Drills.
1—3 Spindle Sipp Drill.
1—Used 5' Niles Radial.

Automatics

2—2" Cleveland Model A Automatics.
1—Used No. 52 National Acme Screw Machine.
1—Used No. 55 National Acme Screw Machine.
1—Used No. 0 Brown-Sharpe Automatic.
1—Used ⅛" National Acme Automatic.

Miscellaneous

1—Used 8" Cox & Son Pipe Machine, 4½" belt, double back geared. 4 step cone pulley.
1—Used 6" Williams Pipe Machine, complete with full set dies.
1—42" Niles Car Wheel Borer.
1—Used Lenox Rotray Bevel Shear, ½" capacity.
1—New Oliver Sawing, Filing and Lapping Machine.
1—Used 2" Jarecki Bolt Cutter, complete with dies.
1—Used No. 55 Bliss Press.
1—Used 3" Curtiss Cutting Off Machine.
1—Used No. 2 Whiton Gear Cutter.
1—20" Smith-Mills Shaper, plain pulley drive.
1—24" Flather Back Geared Shaper, single pulley.
1—Bement Horizontal Boring Mill, knee type.
2—Used Merrill Board Drop Hammers.
1—Used No. 3W Bliss Straight Side Press.
2—New No. 1 Sidney Power Presses.
2—New No. 2 Sidney Power Presses.
2—New No. 3 Sidney Power Presses.

Turret Lathes and Screw Machines

47—NEW 19¾ x 9 Hi-Speed Single Purpose Lathes.
4—Used No. 32½ Garvin Turret Lathes.
1—Used 20 x 6' Perkins Turret.
1—20 x 8' Bridgeport Turret Lathe.
1—Used Conradson Turret Lathe, 24" swing.
2—Used 2" x 24' Jones-Lamson Cone Type Turret.
16—New Vertical Turret Lathes, swing 12¾".
2—50" Niles Boring Mills, with stationary rail, two heads, 18" capacity under heads.

GUARANTEED EXACTLY AS REPRESENTED OR MONEY RETURNED
NO QUESTIONS ASKED

100 Other Tools in Stock

SIMMONS MACHINE CO.

OFFICE AND WAREHOUSE, ALBANY, N. Y.

OFFICES

801-802 SINGER BLDG. NEW YORK
804 DIME BANK BLDG. DETROIT
358 ELLICOTT SQUARE BUFFALO

IMMEDIATE SHIPMENT

Cylinder Borer

60" Horizontal, 9" Bar.

Radial Drills

1 Niles Tool Works, Universal.
4½ Bement-Niles, plain.
4' Universal Radial Drill Co., plain.
4' Baush Machine Tool Co., plain.

Boring Mill

37" Bullard vertical, two heads.

Lathes

36"x18' New Haven.
24"x12' Star, 1½" hollow spindle.
24"x8' Fifield, 2½" hollow spindle.

Miscellaneous

No. 4 Long & Allstatter Double End Punch and Shear.
No. 3 Brown & Sharpe Universal Miller.

Complete Plants Appraised, Bought for Cash, Sold at Public or Private Sale

C. A. CALLESON

50 Church St., New York City

Warehouse and Shops
420 Claremont Ave., Jersey City, N. J.

JUST RELEASED FROM SERVICE

Hundreds of modern machines offered for sale at VERY LOW prices, many of which we have only used from 12 to 15 months. All machines ready for inspection.

ENGINE LATHES

16" x 8' Q.C.G.
18" x 8' and 10' Q.C.G.
20" x 8' and 10' Q.C.G.
25" x 10' and 12' Q.C.G.
} Standard Engine Lathes.

26" Bridgeford Heavy Duty Engine Lathes. Ideal Lathes for Forging Plants and Heavy Machine Work.

TURRET LATHES

25" Le Blond Heavy Duty, turret on carriage.
24" Gisholt Standard Turret Lathes.
18" x 26" Libby Standard Turret Lathes
24" and 28" Steinlie Standard Turret Lathes also 5A Potter Turret and Johnson Semi Auto.
24" Standard Davis Turret Chucking Lathes. Also Jones & Lamson No. 2 Warner & Swasey Turret Lathes.

DRILLING MACHINERY

Foote-Burt & Colburn high power drills
also
Radial and upright drills, standard makes.
Pratt & Whitney & Avey Multiple Drills.

GRINDERS

Brown & Sharpe and Norton cylindrical grinders,
also
Cutter and Reamer and surface grinders, standard makes.
Bryant Chucking grinders with chucks (absolutely new),
also
Wet and dry Emery Grinders.

POWER PRESSES

No. 59¼ Toledo straight sided presses, weight about 75,000 lbs.

HYDRAULIC PRESSES **CUTTING OFF MACHINES**

Westinghouse Electric & Manufacturing Company

Machine Tool Sales Dept.

Garrison Alley Plant **PITTSBURGH, PA.**

Bell 'Phone Grant 5921

Opportunities for Everybody

are being constantly presented through the "Classified Columns" of *The Iron Trade Review*.

Better Positions
More Efficient Help
Manufacturing Opportunities
Second-Hand Machinery, Etc.

are of interest to you and every other reader of this paper.

It will pay you to refer to the "Classified" Section weekly.

"Get the Habit—It pays Dividends"

619

FOR SALE

1—12 x 12Ames Engine.
1—No. 4 Sand Pump.
1—125 H.P. 100-lb. pressure Ames Boiler.
1—5-Ton Niles Traveling crane.
1—5-Ton Whiting Pillar type crane.
1—8 x 10 Hofsting Engine.
1—Gates Rock and Ore Breaker.
—36 K.W. Holzer & Cabot Generator.

A. G. Schoonmaker & Sons Inc.
25 Church Street,
NEW YORK CITY

Reduction in Price—

something unusual these days, but needing the room and in order to move same quickly, we have decided to reduce price on

Crocker-Wheeler
500-K. W. GENERATOR

recently advertised, 20% for quick cash sale.

If interested in securing a good, serviceable D. C.

250-VOLT GENERATOR

direct connected to an Ironton tandem-compound 650 hp. ENGINE immediately, would suggest wiring us, as *delivery* of a unit of this size is quite an item at the present time.

THE IRONTON PORTLAND CEMENT CO.
Ironton, Ohio

TANKS

2—50' x 10' x 5'. Capacity 19,000 gallons each. Have been used for water only. Are well braced and in fine condition.

Power Equipment Company, Engrs.
1218 Chestnut Street Philadelphia, Pa.

Your every want can be quickly, satisfactorily and economically satisfied by placing a little classified advertisement in
THE IRON TRADE REVIEW

639

MACHINERY for Immediate Shipment

CHUCKING MACHINES

3—No. 24 New Britain, 4 spindle Auto Chucking Machines.
1—No. 54 New Britain Chucking Machine, 6 spindles.
4—No. 6A Potter & Johnston Automatic Turning Machines.
3—No. 33 New Britain Chucking Machines.

AIR COMPRESSORS

1—Knowles Steam Pump Works Air Compressor.
1—1160 cu. ft. Norwalk Compound Air Compressor.
1—10x10 Knowles Air Compressor, with silent chain drive.
1—12x12¼ "E" Ingersoll-Rand Air Compressor.
1—10x11x12 Bury Air Compressor.

FORGING MACHINERY

1—No. 1 Ajax Forging Roll for reducing bar stock.
1—10' Corrugating Roll Power Machine.
1—Bliss Special Rolling Machine, capacity No. 12 U. S. Gauge.
1—1½" Ajax continuous feed Upsetting Machine. New.
1—No. 7 High Speed Stop Motion Ajax Bulldozer.
1—1" Burdick Bolt Header.
1—1¼" Williams Bolt Cutter.
1—4" Landis Single Head Patent Bolt Cutter.

CUT-OFF MACHINES

1—3" Hurlbut-Rogers Metal Cutting-Off Machine.
1—4" Pratt & Whitney Cutting-Off Machine with 4 jaw chuck.
1—5" Star Cutting Off Machine with 3 jaw chuck.
1—Hurlbut & Rogers 6" Double Cutting-Off Machine.
1—10" Bement Cutting-Off Machine, 2 heads.

DRILLS

2—2 spindle Horizontal Drills.
1—No. 12 Pratt & Whitney, 2 spindle Gun Barrel Drilling Machine.
1—34" Colburn Boring and Turning Mill, with 3 jaw universal chuck.
1—No. 2 Blaisdell 22" Drill Press, table swing 22".
1—No. 1 Blaisdell 20" Drill Press.
1—No. 2 Quint Drill, 6 spindle turret head.
1—42" Barnes Drill Press, drills to center of 42".

HAMMERS

1—600-lb. Wm. Sellers Steam Hammer.
1—700-lb. Niles-Bement-Pond Hammer.
1—1000-lb. Niles-Bement-Pond Co. Hammer.
2—No. 5-A High Speed Special Hammers with chuck.
1—800-lb. Billings & Spencer Board Drop Hammer.
1—1000-lb. Bliss Board Drop Hammer.

GRINDERS

2—No. 20 Bryant Internal Cylinder Grinders.
1—No. 50 Gardner B. B. Disc Grinder.
1—3" Diamond Internal Grinder, complete with stand.
1—No. 6 Bryant Semi-Automatic Grinder.
1—12" Bristol Precision Rotary Surface Grinder.

LATHES

1—12"x4' Master Engine Lathe, with constant speed drive.
1—14" swing Turret Lathe, 3 step cone.
1—16x6' Bullard Engine Lathe, solid spindle.
1—16x8' Blaisdell Engine Lathe, hollow spindle.
2—22x8' Norwood Lathes.
1—24"x12' Wickes Heavy Duty Engine Lathe.
1—42"x29' Heavy Body Engine Lathe, Pond type.
1—88" Bull Lathe with 3 step cone drive pulley.

PRESSES

2—No. 24 Stoll direct acting Horn Presses.
1—No. 73½ Bliss Straight Sided Trimming Press.
2—No. 20-B Bliss Presses, fly wheel type.
1—No. 8 Bliss double crank Drawing Press.
1—No. 407 double crank, Bliss Toggle Drawing Press.
1—No. 3-C Straight Side double crank Bliss Press.
2—300-ton Bethlehem Hydraulic Presses.

PUNCHES and SHEARS

1—30 ft. Lysholm plate Punching Table.
1—No. 17 Punch and Shear, made by Williams-White Co.
1—10" throat Quick Acting Punch.
1—36" throat Whiting Punch.
1—40" Cleveland Punch.
1—36" throat, style E Rock River Punch.
1—42" throat, style E Rock River Punch.
1—No. 2-A Quickwork Rotary Shear.

SCREW MACHINES

1—13x52' Windsor Screw Machine.
1—Acme Automatic 4 spindle Screw Machine.
2—2¼" Gridley Automatic Screw Machines.
1—2" Cleveland Automatic single spindle Screw Machine.

SAWS

1—Circular Cold Saw, dia. of saw 18".
1—36" dia. Cold Cutting Saw.
2—Espen Lucas Cold Cutting Off Saws.
1—No. 500, 20" Newton Cold Saw.

PLANERS

1—27"x16'x4' Lincoln Iron Planer.
1—32" Heavy Duty Frog and Switch Planer.
1—No. 2 Pratt & Whitney Die Sinker.
1—New Haven Planer, 22" between uprights.
1—54"x54"x12' Lincoln Planer with screw drive.
1—54"x54"x13' 8" New Albany Planer.
1—25"x25"x6' Sellers Planer, worm drive.
1—26"x36"x9' New Haven Planer.
1—16" Davis Shaper, 4 step cone pulley.

WELDERS

1—No. 253 Spot Welder. Made by Toledo Welder Co.
1—15 K.W. Toledo Electric Spot Welder.
1—Electric Butt Welding Machine.
1—No. 110 Toledo Electric Welder.

TANKS, TANK CARS, ETC.

1—824 gallon Cypress Tank.
2—2½" Cypress Tanks, 13' dia. x 13' deep.
2—Cypress Tanks, 2½" thick staves, 17,000 gallons.
1—10' long x 2½' wide x 2½' high Open Top Steel Tank.
1—6000-gallon Open Top Steel Tank, conical bottom.
2—5' high x 15' dia. Open Top Steel Tanks.
1—19'x26'x4' deep Open Top Iron Tank, ¼" iron.
1—45"x72" Steel Tank, double riveted, thickness of head 1¼".
1—48"x72" Steel Tank, double riveted, shell about ½" thick.
1—42" dia. x 12' long, High Pressure Air Steel Tank.
1—7' dia. x 12' long Horizontal Steel Tank, 3500 gallons.
1—5' dia. x 5' high Closed Steel Tank.
1—9' dia. x 8½' high Steel Tank, 4000 gallons.
2—10' dia. x 22' long Steel Tanks. Brand new.
2—9' dia. x 21' long Horizontal Pressure Tanks, 10200 gallons.
2—55,000 barrel Steel Storage Tanks. New.
1—New, 60' dia. x 35' high Steel Oil Tank, 24,000 barrels.

6000 to 10,000 gallon Tank Cars for sale or lease.

NATIONAL PRODUCTS COMPANY, East Liverpool, O.

EQUIPMENT YOU NEED

1—Small Ajax Bulldozer.

1—No. 5 Ajax Bulldozer.

1—No. 2 Williams-White Eye Bender.

1—40-lb. Bradley Cushion Helve Hammer.

Also Upsetters, Furnaces and Tumbling Barrel.

Donahue Steel Products Co.
Peoples Gas Bldg.
Chicago, Ill.

One Truss Type Steel Bridge, 85 ton, one 150' span for E30 loading. Inspection at De Queen, Ark.

De Queen & Eastern R. R. Co.

500 H. P. MOTOR

Account change in plans we offer an Allis-Chalmers 500 H. P., type ANY, 2200 volt, 60 cycle, 3 phase motor, with complete switch-board equipment, now ready for shipment from Milwaukee.

PACIFIC COAST STEEL COMPANY,
Seattle, Washington

CUTTING-OFF MACHINE

One Four-head Southwark.
Designed to cut rounds up to 7" diameter, complete with back gears and pinions including air cylinder for discharging, bed 12' long.

The Milton Manufacturing Company
Milton, Pa.

Upsetting and Forging Machines

1—4" Ajax Upsetting and Forging Machine.

2—2½" Ajax Upsetting and Forging Machines.

1—1½" Ajax Upsetting and Forging Machine.

1—1½" Acme Upsetting and Forging Machine.

Donahue Steel Products Co.
Peoples Gas Bldg.
Chicago, Ill.

HONEST SERVICE

THE BIGGS-WATTERSON CO.

Cleveland, Ohio

NEW MACHINES

1—No. 4B Vertical Milling Machine without rotary.
1—No. 8C Vertical Milling Machine without rotary.
1—23" Stationary Head Drill Press.
1—28" Sliding Head Drill Press.
2—25" Sliding Head Drill Presses.
1—No. 2B Washburn Shops—single spindle drill.
1—No. 32B Demco Floor Type Drill Press, two spindle.
1—No. 32B Demco Floor Type Drill Press, three spindle.
2—No. 23 Demco Floor Type Drill Presses.
3—No. 22 Demco Bench Drills.
1—16" Queen City Shaper—cone drive.
2—20" Queen City Shapers—gear box drive.
4—24" Queen City Shapers—cone drive.
2—14" x 6' Champion Q.C. Lathe with taper attachment.
1—18" x 8' Quick Change Engine Lathe.
5—No. 4½ Bardons & Oliver Hand Screw Machines, each complete with automatic chuck, wire feed and reg. equipment.
1—No. 4½ Bardons & Oliver Hand Screw Machine, complete with power feed to cut off, power feed to turret and regular equip.
1—Webster & Perks No. 2 Floor Type Grinder.
1—Webster & Perks No. 1 Bench Grinder.
1—Webster & Perks No. 1¾ Floor Type Grinder.
1—Webster & Perks No. 1 Floor Type Grinder.
1—No. 2 Grand Rapids Universal Grinder.
1—Webster & Perks No. 7 Polishing and Buffing Lathe.
1—Webster & Perks No. 6 Polishing and Buffing Lathe.
1—No. 1 Circular Attachment 14" Hand Feed.
1—No. 20 Bliss Inclinable Press.
1—No. 4 Canton Floor Crane.
1—No. 2 Canton Floor Crane.
1—No. 1 Racine Hacksaw.
2—6 x 6 Peerless High Speed Metal Saws.
9—No. 2 Toledo Hand Screw Machines.
3—No. 1 Toledo Hand Milling Machines.
1—Simmons Premier Universal Tool and Cutter Grinder.
2—Carroll 10½" Dividing Heads.

USED MACHINES

1—24 x 24" x 8' G. A. Gray Planer—single head.
1—12 x 48" Queen City Plain Grinder. Good as New.
1—6" x 15" Fitchburg Plain Grinder.
1—Kera 21" Upright Drill Press.
11—12" x 6' Gould & Eberhardt Gear Hobbing Machines.
3—24 x 12" Gould & Eberhardt Gear Hobbing Machines.
1—Adams No. 1 Gear Hobber.
5—No. 3—26" Brown & Sharpe Gear Cutters.
1—No. 3—36" Brown & Sharpe Gear Cutter.
1—No. 2 Lapointe Machine Tool Co. single broaching machine.
1—No. 2 Lapointe Machine Tool Co. single broaching machine.
1—No. 2 J. N. Lapointe Machine Tool Co. Double broaching machine.
1—14 x 6' American Engine Lathe, very good condition.
1—24" Brown & Sharpe Vertical Chucking Machine, good condition.
1—Speed Lathe 10" swing 3 ft. bed.
1—No. 1 Warner & Swasey Hollow Hex. Turret Lathe, bar and chucking, good condition.
1—No. 2 Bardons & Oliver Turret Lathe.

We buy and sell Machine Tools. Send us list of your requirements or tools you have for sale.

BENNETT BARGAINS

PLANERS
18-22-26-30-32-36-42-54" between housings; 1-2-3- and 4 heads.
VERTICAL BORING MILLS
30", 36" and 10'.
HORIZONTAL BORING MACHINES
2¼", 3", 4"; also 5" Barret Type.
RADIAL DRILLS
2½, 3 and 6'—Plain and Universal.
UPRIGHT and MULTIPLE DRILLS
12"-24"-36" and 42"; also 3 and 6 spindle.
LATHES
Various sizes from 16" to 64" swing.
TURRETS
2 x 24", 20 x 6", 20" also 34".
MILLING MACHINES
58 x 38 x 14' Ingersoll 4 heads; 20" x 7' Brainerd.
No. 2 Lodge & Davis; No. 2 Hilles & Jones vertical.
Also Punches and Shears, Gear Cutters, Grinders, Hammers, Presses, Cranes, Bolt and Pipe Machines.
Advise us of all equipment you wish to purchase or sell.

G. L. Bennett Machinery Co., Inc.
30 Church Street, New York City

Desirable Tools

Available for

Immediate Shipment

1—No. 0-3" Bar Fosdick Hor. Boring Mill.
1—No. 10-3½" Bar Beaman Smith Hor. Boring Mill.
1—No. 10 Bryant Chucking Internal Grinder.
1—4 spindle Moline Cyl. Boring Machine.
2—No. 2 P & W single spindle Die Sinkers.
1—18,000-lb. Waterbury-Farrel S. S. trimming press, geared with side shear.

Riverside Machinery Depot
Detroit, Mich.

FLY WHEEL

About 9½" face, 17" bore, 20' 2" diameter, 46000 lbs.
Excellent condition. Low price.

Henry Potts & Company,
650 Real Estate Trust Bldg., Phila., Pa.

Immediate Delivery

USED MACHINERY

WOODWORKING

1—American Woodwork Machy. Co. No. 401409—34" band saw—rubber tired wheels—32"x32" cast iron adj. table—belt driven from motor.
1—American Woodwork Machy. Co. (Montgomery, Pa.) Levi Houston 8" 4 side outside molder—square heads—with attached countershaft belt driven from motor—700 knives for same.
1—Central Machine Works, double head shaper—double belted wood table 41" x48" with extension table 48"x60" floor countershaft belt driven from motor.
1—16"x10' pattern makers lathe 4 slip cone, wood bed—T rest— tail stock and overhead countershaft.
1—16" jointer—C. O. & D. A. Porter (Grand Rapids, Mich.)
1—Rip saw—Sidney Tool Co. (Sidney, Ohio).

IRON WORKING

1—Old style 24"x24"x7' spur gear planer single head on cross rail-hand elevating device and overhead countershaft.
1—S. C. Forsaith Mach. Co. (Manchester, N. H.) 18"x6' single back geared engine lathe rod and rack feed-compound rest and special tool holder overhead countershaft.
1—Pratt & Whitney Co. (Hartford, Conn.) 16"x8' single back geared engine lathe—compound rest—rack and screw feed and double friction countershaft.
1—Planer 37"x14'—Herringbone gear drive—single head with cross and vertical feed—A. Insler (Newark, N. J.)
1—Horizontal slide valve steam engine 8"x9" developing about 25 horse power.
1—Lathe 14"x6' four step cone—screw cutting—chuck—face plate, etc.
1—Lathe 16"x6' four step cone—screw cutting—chuck—face plate, etc.
1—J. G. Blaunt, emery stand, taking 18" wheel.
1—Emery stand—arranged for 16" straight wheels one side, and 16" cylinder, other side.
1—Air compressor (Rand Drill Co.) Imperial type 10 shop No. 13366. Size 8x8x10 steam. Size 12x7½x10 air.
1—Q & C—metal cutting saw—24" diameter x ¼" thick blade Mfgd. by Hanna Engineering Works.

All above machinery is in good condition, and can be inspected at our plant. Prices and terms on application.

The Flour City Ornamental Iron Co.

Minneapolis, Minn.

1—54" Hewes & Phillips Massive Type Geared Slotter

1—NEW 8000-lb. Steam Forging Hammer.
1—36" stroke Wetherill Traveling Head Shaper.
2—1 yd. Steel Contractor's Buckets.
1—80,000 lb., 200,000 lb. Riehle Testing Machine
2000 tons Rails, 60, 70, 80 and 85 pounds, with splices.

HAMMERS

1—6000-lb. Chambersburg.
1—2400-lb. Drop.
1—2000-lb. Toledo Board Drop.
1—1600-lb. Morgan single frame.
1—1500-lb. Dudgeon Arch Steam.
1—800-lb. Bell sgle. fr. st.
1—650-lb. Steam Forging.
1—600-lb. Bliss Board Drop.
1—200-lb. Bradley.
1—40-lb. Bradley.
Hammers, all sizes, steam forging, drop, power and board drop.
Presses, all sizes, forging, wheel hydraulic and power.

PRESSES

1—No. 75½-8 Bliss.
1—No. 77½ Bliss.
1—No. 76½ Bliss.
1—No. 355 Bliss Special.
1—No. 34 Toledo Geared.
1—No. 3C Bliss.
1—No. 1½ Bliss Toggle Drawing.
1—No. 114 Bliss "Stiles" dble. cr.
1—300-ton Niles Hydraulic Wheel.
1—150 Hydraulic Flanging.

LOCOMOTIVE CRANES

1—10-ton American 4wh. 50'.
1—15-ton Brownhoist 8wh. 46'.
1—15-ton Browning 8wh 42'.
1—20-ton O & S 8wh MCB 45'.
1—20-ton Link Belt 8wh 46'.

OVERHEAD TRAVELING CRANES

1—10-ton P & H 60' span.
1—20-ton Whiting 48' 6" span, 3 motor.
1—7½-ton Shaw 80' span 3-motor.

PLANERS

82" x 48" x 10' Woodward & Powell.
30" x 30" x 8' Cinti.
28" x 28" x 8' Cinti.

NEW MILLERS

Nos. 1-2-3 Kempsmith Univ.
No. 3 Cincinnati Univ.
3H LeBlond Univ.

NEW SHEARS

No. 5 Canton, cap. 3 in.
No. 3 Doelger & Kirsten, 3¾".
No. 4 Doelger & Kirsten, 4".

NEW DRILLS

5' Reed-Prentice Plain Radial.
36" Snyder Hy. Pattern.
30" Snyder Std. Sliding Head.

LATHES

48" Niles Car Wheel Lathe.
16" x 8' Flather, New.
15" x 8' Robbins, New.
18" x 8' South Bend, New.

PIPE MACHINES

2½"-8" Williams, New.
2½"-8" Merrell, New.
2½"-8" Bignall & Keeler.

HOISTING ENGINES

1—7x10 Byers DC DD.
1—7x12 Mundy DC DD.
1—6¼x10 Amer. DC DD.
1—8¼x10 Clyde DC DD.

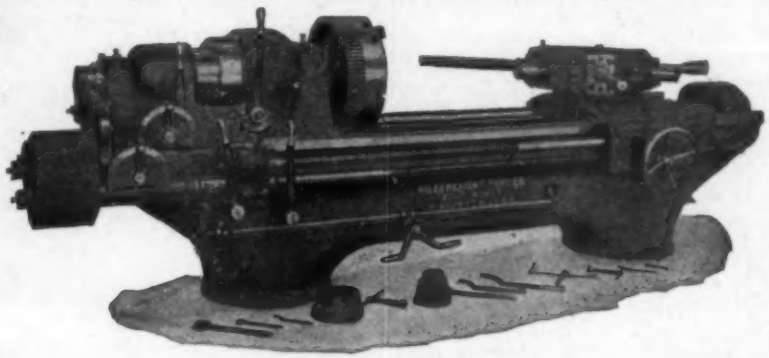
Locomotives, Buckets, Steam Shovels, Cars, Tanks, Steel Buildings, Air Compressors, Boilers.

WHAT DO YOU WISH TO BUY? WHAT HAVE YOU FOR SALE?

Machine Tools, Machinery and Equipment of every description, steam, electrical and hydraulic.

Railway & Power Equipment Co.
Woolworth Building, New York **Telephones: Barclay 3251-3252**
(Established 1900)

Available for Immediate Shipment.



1—28" Niles Rigid Turret Lathe, used, but in first-class condition and complete.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Ave., Detroit, Mich.

RAILS, MACHINERY and EQUIPMENT

New and Used. Buy, Sell or Exchange.
L. A. GREEN, Pittsburgh, Pa.
1609 First National Bank Bldg.

FIRST—Get Bulletin 250—88 pages, Bargains.
ZELNICKER IN ST. LOUIS
Before buying or selling
RAILS
Locomotives, Cars, Tanks, Machinery, Piling, Etc.
What have you for sale?

Punch and Shears

1—50" Throat—Single End—2" x 1" cap.
1—50" Throat—Single End—1" x 1" cap.
1—42" Throat—Single End—1" x 1" cap.
1—36" Throat—Single End—2" x 1" cap.
1—36" Throat—Single End—1" x 1" cap.
1—34" Throat—Single End—1" x 1" cap.
1—12" Throat—Double End—1"x1" cap.
1—7½" Throat—Double End—⅞x¾" cap.
1—6" Throat—Double End—¾x¾" cap.
2—6" Throat—Single End—⅝x⅝" cap.

We carry in stock full line of Machine Tools.
Send us your inquiries.
Wayne Machinery Company
Fort Wayne, Indiana

BLOCKS

Steel and Wood Tackle Blocks of all diameters
For Immediate Shipment
WIRE ROPE NEW AND USED
ATLANTIC EQUIPMENT CO.
New York City, N. Y.

Alternating Current Generators and Engines

2—150 K. W. General Electric revolving field, belted, including Engines—a complete plant.

1—200 K. W. General Electric, direct connected to compound Corliss Engine.

Innumerable others in stock.

Power Equipment Company, Engrs.
1218 Chestnut Street Philadelphia, Pa.

BOILER

1—Ames Iron Works horizontal tubular boiler 17' 5" long. 72" dia. 125 H.P. 100 lbs. pressure. Excellent Condition.

A. G. Schoonmaker & Sons, Inc.
25 Church St. New York City

FOR SALE

IMMEDIATE SHIPMENT

One Westinghouse—Parsons Turbo-generator unit, turbine 7,500 K. W. 1200 R. P. M., 200 lbs. pressure. Generator rated 9375 K. V. A. at 80% power factor, 2300 volts, 3-phase, 60 cycles, complete with Westinghouse LeBlanc No. 18 condenser with steam turbine driven air and circulating pump.

THE NORTHERN OHIO TRACTION & LIGHT CO.
AKRON, OHIO

BARGAIN PRICES—PROMPT SHIPMENT—WICKES QUALITY

REFITTED MACHINERY

MONEY-BACK GUARANTEE

BOILERS

One 400 H.P. Wickes Water Tube, 150 lbs.
Two 300 H.P. Wickes Water Tube, 150 lbs.
Two 72" x 18' HRT 150 H.P., 125 lbs.
Two 66" x 16' HRT 100 H.P., 125 lbs.
One 74" x 25' Manning Vert. 200 H.P., 125 lbs.
One 84" x 16' Marine Portable, 100 H.P.
One 15 H.P. Ames with engine on top.
100 other boilers.

SMOKE STACKS

One 72" dia. 82' high.
11-26" dia. 90' high.

ENGINES

22 x 42 Allis-Chal. Corliss, 325 H.P.
16 x 36 Murray Corliss, 150 H.P.
14 x 30 Watts-Camp. Corliss, 100 H.P.
12 x 30 Nagle Corliss, 80 H.P.
10 x 24 Harris Corliss, 50 H.P.
20 x 18 Watertown, 4 valve, 300 H.P.
14 and 28 x 24 Buckeye Cross Compound, 300 H.P.
16 x 14 Ames Automatic, 200 H.P.
13 x 16 Chandler & Taylor Auto., 125 H.P.
11 x 11 Ball & Wood Auto., 100 H.P.
10 x 12 Erie Automatic, 70 H.P.
16 x 16 Noye Throttling, 100 H.P.
14 x 16 Nagle Throttling, 80 H.P.
12 x 16 Erie Throttling, 60 H.P.
10 x 12 Erie Throttling, 60 H.P.
40 H.P. 5-cylinder N. Y. Safety Gasoline Engine.
3-Dake #3½ 7 H.P. Rotary Reversible Engines.
14 x 14 Nagle Vertical, 70 H.P.
12 x 14 O & S Vertical, 60 H.P.
9 x 9 Nagle Vertical, 30 H.P.
75 H.P. De Laval Steam Turbine with reducing gears.
200 other engines.

HOISTS

9½ x 12 Lambert DC SD link reversing cableway engine with friction spools and winch head.
7 x 10 Haiss DC DD Coal Hoist.
7 x 10 American DC SD.
6 x 12 Parker DC DD with boiler.
6 x 12 Kendall DC SD with boiler.
14 x 18 Lidgerwood DC SD second motion reversing mine hoist.
60 H.P. 220 V. Dir. Cur. DD & Swinger.
40 H.P. Lambert 220 V. Dir. Cur. DD.
35 H.P. Kendall 500 V. Dir. Cur. DD.
21 H.P. Lidgerwood 550 V. Dir. Cur. DD.

PUMPS

	GPM
16 and 25 x 15 x 15 Worthington Comp. Duplex	1800
14 and 20 x 12 x 15 Worthington Comp. Duplex	1150
12 and 17 x 11 x 15 Worthington Comp. Duplex	963
10 and 16 x 10 x 10 Worthington Comp. Duplex	753
9 and 14 x 8½ x 15 Worth. pot valve	565
20 x 12 x 15 Worthington pot value	1170
18 x 5½ x 18 Knowles pot valve duplex	366
18 x 9½ x 12 Buffalo duplex	900
17 x 12 x 15 Worthington duplex	1170
16 x 10 x 10 Worthington duplex	750
14 x 10 x 10 Worthington duplex	750
16 x 10 x 16 American single	400
14¾ and 24 x 5 5-8 x 18 Knowles comp. single	100
14 x 8 x 14 Epping-Carp. pot val. single	260
14 x 14 x 10 Blake duplex	1415
12 x 14 x 12 Smith-Vaile duplex	2000
10 x 14 x 10 Worthington duplex	1660
10 x 14 x 18 Warren single	800
12" Worthington Centrifugal	4000
10" Morris Sand Pump	3000
4" Morris Centrifugal with engine	400
24 x 12 x 16 Cameron sinking	587
#6 Pulsometer sinking	300
12 x 14 Gould triplex	1530
8 x 12 Deane Triplex	700
16 x 9 x 12 Knowles Underwriters	750

500 other pumps.

ROTATIVE VACUUM PUMPS

8 x 18 x 12 Wheeler, wet.
8 x 18 x 18 x 14 Alberger 2 stage Corliss, dry

FEED WATER HEATERS

6000 H.P. National.
4000 H.P. Cochrane.
2500 H.P. Goubert.
1200 H.P. Berryman.
750 H.P. National.
50 other heaters.

MOTORS

200 H.P. General Electric 220/440 V.
75 other A. C. Motors.
40 H.P. C & C 220 Volt DC.
25 H.P. Sprague 220 Volt DC.
15 H.P. General Electric 220 Volt DC.
10 H.P. General Electric 220 Volt DC.
100 H.P. General Electric 110 Volt DC.
80 H.P. General Electric 110 Volt DC.
55 H.P. General Electric 110 Volt DC.
30 H.P. Rushmore 110 Volt DC.
20 H.P. Westinghouse 110 Volt DC.
15 H.P. C & C 500 Volt DC.
15 H.P. General Electric 500 Volt DC.
85 other D. C. Motors.

GENERATORS

100 KW Gen. Elec. 125 Volt Ames Engine.
75 KW Gen. Elec. 125 Volt, belted.
60 KW Bullock 125 Volt Ames Engine.
60 KW Westinghouse 125 Volt, belted.
50 KW Westinghouse 125 Volt Ideal Engine.
50 KW C & C 250 Volt, Payne Engine.
45 other generators, all sizes.

COMPRESSORS

20x20x30 Rand duplex steam, 2000'.
12x19x14x18 Smith-Vaile duplex compound, 750'.
12x18¼x12½x12 Ingersoll 2 stage, 526'.
12x12x12 Platt Straight Line steam, 235'.
18x15 Ingersoll-Rand duplex belted, 1600'.
40 other compressors.

CRUSHERS

No. 5 Austin Gyratory.
No. 3 Gates Gyratory.
10½"x22" Climax Jaw Crusher.

HEATERS & BLOWERS

16 pipe coils containing 23,400' 1" pipe.
12' Sturtevant Blower with engine.
8' Buffalo Blower with engine.
78" Sturtevant Monogram Blower.
55" Buffalo Cupola Blower.
1600 cu. ft. Sirocco Double Blower with 75 HP. Steam Turbine.
84" Sturtevant Exhauster with 3-HP. 220-Volt DC Motor.
50 other blowers and fans.

MACHINE TOOLS

24" x 31' Sellers Lathe.
18" x 15' Blaisdell Lathe.
16" x 6' Reed Lathe, taper att.
2 x 24" Jones & Lamson Turret Lathe.
24" Barnes Drill, sliding head BG.
28" Snyder SH BG.
24" Foote-Burte Heavy Drill.
40" Bickford Radial tapping att.
30" W. E. Gange Co. Plain Radial.
Newton 6" Cold Saw.
650 lb. Knoxville Steam Hammer.
600 lb. Lane Steam Drop Hammer.
30 x 30 x 8' Whitcomb Planer.
26 x 26 x 6' New Haven Planer.
21 x 96 Landis Universal Grinder.
4" Cox Pipe Machine.
6" Curtis Power Pipe Machine.
28" x 6½' Newton Slab Miller.
No. 4 Brown & Sharpe Plain Miller.
No. 2 Brown & Sharpe Universal Miller.
Bement Horizontal Boring Mill, 2½" bar.
24" Hendey Shaper.
7" Alligator Shear.
10' Hilles & Jones Plate Bending Rolls.
6' Wickes Plate Bending Rolls.
Watson-Stillman Hydraulic Rail Bender.
3 ton geared Foundry ladle.
No. 2 Brown & Sharpe Annealing Furnace.

TANKS

2—36" x 21' pressure.
4—36" x 18' pressure.
2—6' x 31' new closed storage.
5' x 30' closed storage.
5' x 16' closed storage.
4—66" x 9' enamel lined new.
42" x 26' closed storage.
5—18' x 0' 9" x 4' open storage.
10' x 14' 9" high open storage.

MISCELLANEOUS

26" Centrifugal Dryer.
6' x 6' Steam Jacketed Kettle.
36" x 33" Jacketed Nitrating Kettle.
United States five mould Brick Press.
New 21' Exeter Concrete Mixer, steam power, on wheels.
No. 4 Ransome Batch Concrete Mixer.
6—2½-yd. Lockwood bottom dump Concrete Buckets.
3—1½-yd. side dump, 30" gauge cars.

WE BUY AND SELL SINGLE MACHINES AND COMPLETE PLANTS. SEND FOR OUR COMPLETE LIST

WICKES MACHINERY CO., Jersey City, N. J.

MAC GOVERN & COMPANY INCORPORATED

POWER MACHINERY

114 LIBERTY STREET - - NEW YORK, N. Y.

ALTERNATING CURRENT MOTORS

IN STOCK FOR PROMPT SHIPMENT

TURBO-GENERATOR UNITS—60 Cycle

1—1250 KW. Westinghouse-Parsons horizontal turbo-unit, 3 phase, 2300 volts, 3600 RPM., with LeBlanc jet type condenser and turbine driven pumps.

1—750 KW. General Electric-Curtis horiz. turbo-unit, 3 phase, 2300 volts, 3600 RPM., mixed pressure, with C. H. Wheeler surface condenser vacuum and circulating pumps, etc.

2—625 Kva. Westinghouse-Parsons horiz. turbo-units, 3 phase, 440 volts, 3600 RPM.

1—550 KW. Gen. Elec.-Curtis vertical non-condensing turbo-unit, 3 phase, 440 volts, 1800 RPM.

1—550 KW. Gen. Elec.-Curtis, vertical, non-condensing turbo-unit, 3 phase, 4600 or 2300 volts, 1800 RPM.

1—500 KW. Allis-Chalmers horizontal turbo-unit, 3 phase, 480 volts. 3600 RPM., with Allis-Chalmers jet condenser and necessary pumps.

1—500 KW. Gen. Elec.-Curtis vertical turbo-unit, 3 phase, 4000-2300 volts, 1800 RPM., with Wheeler Cond. & Eng'g Co. jet condenser and necessary pumps.

2—500 KW. units, Gen. Elec.-Curtis horizontal, 3 phase, 2300 volts, 3600 RPM., with switchboards and 1400 sq. ft. C. H. Wheeler surface condensers complete with auxiliaries.

MOTOR-GENERATOR SETS—60 Cycle

1—750 KW. set consisting of one 750 KW. Gen. Elec. MCF form L generator, 250 volts, 720 RPM., conn. by flexible coupling to 1100 Kva. C. E. syn. motor, ATI-10, form C, 3 phase, 2300 volts.

1—500 KW. set consisting of one 500 KW. Gen. Elec. gen., MP-A, 275 volts, 400 RPM., dir. conn. to 530 KW. Gen. Electric syn. motor, 3 ph., 2300 volts, with switchboard and suitable instruments.

1—500 KW. set consisting of two 250 KW. Crocker-Wheeler type DA generators, each 125 volts, 720 RPM., on common base and dir. conn. one at each end of 845 Kva. Crocker-Wheeler syn motor, 3 ph., 2200 volts, with switchboard and suitable instruments.

1—300 KW. set consisting of one 300 KW. Gen. Elec. generator, 500 volts, 400 RPM., conn. by flanged coupling to one 400 HP. Gen. Elec. form K motor, 3 ph., 2300 volts, with switchboard and suitable instruments.

1—187 KW. set consisting of one 187 KW. Westg. type HS gen., 250 volts, 695 RPM., conn. by flexible coupling to 250 HP. Crocker-Wheeler slip ring motor, 3 ph., 2300 volts.

1—75 KW. set consisting of one 75 KW. Westg. SK gen., 125 volts, 1140 RPM., dir. conn. to 112 HP. Westg. CCL motor, 3 ph., 2200 volts, with switchboard and suitable instruments.

1—40 KW set consisting of one 40 KW. Gen. Elec. MPC gen., 125 volts, 1200 RPM., dir. coupled to 75 HP. Westg. slip ring motor, 3 ph., 550 volts, with switchboard and suitable instruments.

1—35 KW. set consisting of one 35 KW. Bullock gen., 120 volts, 850 RPM., coupled to 50 HP. Westg. type C motor, 2 ph., 400 volts.

1—35 KW. set consisting of 35 KW. Gen. Elec. DLC generator, form A, 4 pole, interpole, compound wound, 125 volts, 1160 RPM., dir. coupled on common base to 50 HP. Gen. Elec. form K motor, 3 phase, 60 cycle, 2300 volts.

OIL ENGINE UNITS—Alternating Current

1—300 KW. Gen. Elec., 3 ph., 60 cy., 600 Volts, type ATB, form D, 44 pole, 164 RPM., dir. conn. to two 225 HP. Diesel oil engines, 16" x 24", complete with gauges, safety valves and all usual appurtenances.

1—125 KW. Gen. Elec., 3 ph., 60 cy., 240 Volts, type ATB, form M, 36 pole, 200 RPM., conn. to 170 HP. Diesel type A-3 vertical oil engine, 12" x 21", with exciter and usual appurtenances.

Direct Current

1—160 KW. Allis-Chalmers-Bullock, 250 Volts, 6 pole, 160 RPM., dir. conn. to 16" x 24" Diesel 3-cylinder vertical oil engine, with usual appurtenances.

GAS ENGINE UNITS—Direct Current

1—130 KW. Crocker-Wheeler, 250 Volts, 8 pole, CCB, 225 RPM., dir. conn. to one size 16 Alberger Buffalo twin tandem gas engine.

1—7¼ KW. Fairbanks-Morse, 110/115 Volts, type TR, 350 RPM., dir. conn. to 8" x 10" Fairbanks-Morse vertical gas engine.

AIR COMPRESSORS—Steam Driven

1—4000 cu. ft. Rand cross compound, 2 stage air compressor, 22 in. x 40 in. x 39 in. x 24 in. x 48 in., class RBB-3, 65 r.p.m., steam end designed for 150 lb. steam pressure condensing, air end for 80 lb. Engine girder frame type, flyball governor, flywheel in two sections, 16 ft. diam. x 10 in. face. Complete with intercooler and all usual fittings.

1—2626 cu. ft. Ingersoll-Sargent cross compound air compressor, H.P. 22 in. x 22½ in. x 42 in., L.P. 40 in. x 36½ in. x 42 in., 70 r.p.m., air pressure 90 lb., 100 lb. and 110 lb., steam pressure 120-140 lb. condensing. Engine tangye frame, flyball governor, flywheel 18 ft. diam. x 14 in. face in 8 sections. Complete with intercooler, aftercooler, lubricator, etc.

1—1000 cu. ft. Ingersoll-Rand steam driven, straight line air compressor, class A-1, size 20 in. x 22¼ in. x 24 in., rated capacity at 85 to 100 lb. pressure. Complete with flyball governor, sight feed oilers, lubricator, etc.

1—545 cu. ft. Clayton duplex air compressor, 2 stage, size 10 in. x 18 in. and 10 in. x 10 in., rated capacity at 185 r.p.m., and 90 lb. pressure. Complete with combined steam and air regulator, intercooler, lubricator and all usual fittings.

1—114 cu. ft. Ingersoll-Rand low pressure air compressor, type NF-1 Complete with unloader and all usual fittings.

STORAGE BATTERY LOCOMOTIVE

1—3-ton Baldwin-Westinghouse Industrial Storage Battery Locomotive. Practically new. Run less than 5 miles. Track gauge 40". Wheel base 36". Length excluding bumpers 9' 8". Height over cab 6' 6". Cab removable. Extreme width 60". Rated draw bar pull 1200 lbs. at a speed of 3½ miles per hour. Motors: 2 Westg. type V-54x-4, with double reduction gearing, one motor geared to each axle. Battery Equipment: Edison battery of 63 cells, A-6. Cutler-Hammer charging rheostat.

We shall be glad to mail complete list of Electrical, Steam and Hydraulic Machinery upon request

Pittsburgh Office: 498 Union Arcade Building

Bolt and Pipe Machines

1½" Acme, double head.
¾" Acme, double head, motor 3/60/220.
1½" Acme, single head. (2).
1½" Acme, 2-spindle Nut Tapper.
6" Williams Pipe Machine.
8" E. C. & B. Pipe Machine.
12" Curtis Pipe Machine.

Forging Machines

4" Ajax Upsetter.
2½" Ajax Upsetter.
No. 5 Ajax Bulldozer.
No. 5 and No. 6 W.-W. Bulldozer.

Hammers

1000-lb. Niles-Bement, steam.
700-lb. Niles-Bement, steam.
700-lb. Pittsburgh, steam.
600-lb. Morgan, steam.
2000-lb. Toledo Board Drop.
25-lb. Upright, Helve, Bradley.
100-lb. and 50-lb. Little Giant. (New).

Milling Machines

No. 3 Cincinnati, Univ., index head.
No. 3 Cincinnati, plain.
No. 3 Brown & Sharpe, Univ., index head.
No. 4 Garvin, plain.
No. 2 Cleveland, Universal. (New).

Punches, Shears and Rolls

50" Tht., single, cap. 1¼x1", Cin.
15" Tht., double, cap. 1¼x1", W-W.
14" Tht., double, cap. 2½x1½", W-W.
15" Tht., single, cap. ½x½", hand.
Shear, Guil. No. 6 Cleve. cap. 4½" sq.
Shear, Guil. No. 5 Cleve. cap. 2½" sq.
Shear, Guil. No. 3 Cleve. cap. 2" sq. (2).
Shear, Guil. No. 0 H. & J. cap. 1¼" rd.
Shear, Guil. No. 3 Wilder, cap. 1" rd.
Shear, Squaring, 158" Covington. cap. ¼".
Shear, Squaring, 108" Bertsch, cap. ¼".
Shear, Squaring, 26" United, cap. ⅛".
Shear, Squaring, 26" Niagara, cap. 16 ga.
Shear, Squaring, 30" P. S. & W. cap. 18 ga.
Shear, Bevel, Thompson, cap. ½".
Shear, Rotary, Newbold, cap. ¾" plates.
Shear, Rotary, Newbold, cap. ⅜" plates.
Shear, Rotary, Newbold, cap. ¼" plates.
Rolls, bending, 10' Bertsch, cap. 14 ga.

Motors

50 H.P. G. E., 3/60/220.
30 H.P. Burke, 3/60/220, 1800 rev.
20 H.P. Burke, 3/60/220, 900 rev.
20 H.P. Fairbanks, 3/60/220, 900 rev.
90 KVA, Lincoln, 3/60/220, 1200 rev.
10 H.P. Fairbanks, 2/60/400, 1200 rev.
15 H.P. G. E., 500 V. D.C., 1200 rev.
10 H.P. Westg., 500 V. D.C., 1250 rev.
12 K.W. G. E., 125 V. D.C., 1500 rev.

Presses and Brakes

No. 65 Toledo Special (Cam) 7" stroke.
No. 74½ Bliss equiv. 1½" stroke, geared.
No. 65 Consolidated, 4" stroke, geared.
No. 2 Waterbury-Farrell, 8" stroke, geared.
No. 25 Niagara, arch, 2½" stroke, plain.
No 6½-A Perkins, 2" stroke, geared
No. 4 Bliss (Stiles) 1½" stroke, plain.
No. 46 Perkins, 2" stroke, geared, adj. table.
No. 5 and 6 Toledo, O. B. I., plain.
No. 4 Garrison, O.B.I. 2" stroke, plain.
13' 6" Garrison Brake, 118,000-lb., cap. ¼".
8' Robinson Brake, cap. 16 ga., hand.

Shapers and Planers

28" Queen City, crank, gear box (New)
24" Kelly, crank, geared. (New).
24" Hollingworth, crank, geared. (New).
24" Queen City, crank, geared.
24" Cincinnati, crank, geared.
21" Hollingworth, crank, geared. (New).
18" Hollingworth, crank, geared. (New).
30" x 30" x 8' Gray Planer, 1 head.
30" x 30" x 10' American, 1 head.

Miscellaneous

Bulldozer, No. 5 Ajax.
Bulldozers, No. 5 and 6 Williams-White.
Compressor, 8 x 8" Chicago, belted.
Forging, Heading and Upsetter 4" Ajax.
Forging, Heading and Upsetter 2½" Ajax.
Screw Machine, ¾" Cleve. Automatic.
Screw Machine, 1¼" Cleve. Automatic.
Slotter, 12" stroke, 26" rotary table.
Thread Roller, ¾" Waterbury-Farrell.

Partial List—Stock Shipments

Service Eliminates Competition

WE BUY—SELL—EXCHANGE

McCoy-Brandt Machinery Company

214 PENN AVE. PITTSBURGH, PA.

IMMEDIATE DELIVERY

SUBJECT TO PRIOR SALE

Covington No. 2 horizontal punch 1" thru 1".
Sellers Bull Riveter (steam) 72" stake, 12" throat.
Double Frame Steam Hammer.
Large concrete mixers, tubs, etc.
Pipe Threading Machines, cap. ⅛" to 12".
100 ton 42 ft. Fairbanks Track Scale.
2-Yard Hayward Motor Clamshell Bucket.
Slab Charging Crane. Span 41' 10¾". Motor 220 V. D.C.
2 Structural Beam Straightening Machines.
2 Open Hearth Steel Furnaces with ladle and floor cranes and steel casting equipment. Also buildings and accessories. For removal or operation at present site.
250-ton Hot Metal Mixer ladle car and scale.
2—Carbondale Machine Co. Air Compressors.
McMyler Conveyor Bridge (steam driven), span 158'-10½".
100 ton Hydraulic Riveting Machinery (Riveter, Tower Crane, Accumulator, Pressure Pump).
2" Acme Cutting Off Machine.
Structural Frame for 12 story building.
Vertical Plate Rolls. Cap. 1¾"x108" Motor driven.
22" Sheet Bar Mill, Allis Chalmers Eng. 26" x 60".
32" 2-High Blooming Mill and Engine.
Overhead Electric Traveling Cranes.
Ladles—1-30-ton; bottom pour; 1-18-ton; 1-½-ton top pour.

(The foregoing all good second-hand condition.)

1-20 ton bottom pour ladle.
Plate Rolls (Forged) 26'0", motor or engine driven.
35,000 Gal. Hemispherical Bottom Tank, on 50 ft. Tower.
Complete outfit, including pump (250 gals.).
7 x 10 Oil Engine and 6" pipe line 2000 ft. long.
Boiler House 22' 0" x 28' 10".
Bolt and Nut Machinery.

(The six preceding items never used)

Address Rolling Mill and Steel Works Dept.

MITCHELL-TAPPEN CO.

15 John St., New York Phone Cortlandt 2440

We are headquarters for

Locomotive Cranes

that will stand inspection and that we can actually deliver. We have for prompt delivery the following:

1 Fifty ton eight wheel
1 Forty ton eight wheel
2 Twenty ton eight wheel
1 Fifteen ton eight wheel
2 Fifteen ton four wheel
1 Ten ton four wheel
1 ¾ yd. Thew Road Tractor Shovel

Specifications and prices on request.

Shippers' Car Line, Inc.
165 Broadway, New York

Telephone Cortlandt 4942

FOR SALE

New Traveling Crane

One new Standard Type "E" Northern Traveling Crane — 25 ton capacity, 80' Span. Never used.

American Chain Company, Inc.
Bridgeport, Conn.

FOR SALE

One "Whiting" 20 ton, hand operated 2 speed, cable drum,

Traveling Crane

36'-0¼" span, 18 ft. lift. Complete with transverse carriage, hook block, load cable and all hand chains.

133 lineal ft. 18" Steel I Beam.
133 lineal ft. Steel Tee Track.

All of the above material is new.

Interlake Pulp & Paper Co.
Appleton, Wisc.

List of SECOND HAND MOTORS and MACHINERY FOR SALE

1—10 H.P. 220 Volts D.C. Western Electric Type E.Q.
2—10 H.P. 230 Volt G.E. Type C.Q.,D.C.
1—15 H.P. 230 Volt D.C. Robbin Myers.
1—10 H.P. 230 Volt D.C. Bullock.
1—10 H.P. 230 Volt D.C. G.E. Type C.E.
1—75 K.W. 125 Volt D.C. Generator.
2—15 H.P. Series Wound Crane Motors.

Worthington Duplex Steam Pumps

1—7½-4½ x 10.
1—10 x 10 x 10.
1—Cameron Double acting Simplex Pump 12" and 7½ x 18.
1—No. 1 Tate Jones Fuel Oil Pump and Heating System.
1—Fraser & Chalmers R. H. Corliss Engine 36 x 40 without Fly wheel.
1—9x15 Tandem Reversing Engine by Erie Engine Wheel Works, Erie, Pa.
1—Monorail Crane 7½ H.P. Hoist 3¼ H.P. Bridge.
1—No. 4 Bethlehem Rotary Plate Shear.
1—Grinding Pan (wheel mill), Diameter of Pan 9 ft. Wheels 48x12.
1—12"x12"x14" Steam Air Compressor by Hall Steam Pump Co.
1—No. 5 Sturtevant Blower.
1—No. 7 Rotary Blower by P.H. & F.M. Roots, Connersville, Ind.
1—12x2½" Centrifugal Pump.
1—Snall Rock Crusher (6" Jaws) by Joshua Hendy Co., San Francisco.
1—5-ton Traveling Crane 16'-6" Span by Moran & Co., Seattle.
1—Double Drum Steam Winch 7" x 12".
1—Badenhauser 3 Drum Water Tube Boiler. Lap seams.
1—Locomotive Crane. Industrial Crane No. 3115 (Bay City) 8 wheel Capacity 12½ tons.

PACIFIC COAST STEEL CO.,
SEATTLE, WASH.

230 Volt D. C. Motors

No.	HP	RPM	Wdg.	Type	Make
1	¼	975	Sh.		Westinghouse
2	1	750	Series	D	Mach. App.
1	3	1100	Sh.	Form A	General Elec.
1	5	1650	Sh.	C	General Elec.
3	7½	850	Sh.	A	Gibbs
1	7½	1100	Sh.	Class 4	General Elec.
1	10	750	Sh.	MP	Burke
3	10	750	Sh.	MP	Northwestern
1	10	1700	Cp.	MP	Burke
1	10	1150	Cp.	Sk	Westinghouse
1	15	925	Sh.	CVC	General Elec.
1	15	1750	Cp.	CVC	General Elec.
1	15	650	Sh.	MP	Triumph
1	15	725	Cp.	MP	Northern
1	15	800	Sh.	CM	Crocker-Wheeler
1	17½	600	Sh.	A-14	Gibbs
1	17½	585	Sh.	A-14	Gibbs
1	20	650	Sh.	MP	Burke
1	20	975	Sh.	MP	Fairbanks-Morse
1	20	900	Sh.	MP	Hobart
1	20	800	Sh.	MP	Imperial
1	20	650	Sh.	MP	Milwaukee
1	20	975	Sh.	S	Westinghouse
1	20	600	Sh.	MP	Western Elec.
1	20	750	Sh.	MP	Northern
1	25	650	Sh.	MP	National Brake
1	25	775	Sh.	MP	Western Elec.
1	25	675	Sh.	CL	General Elec.
2	25	800	Cp.	MP	Northern
1	25	700	Sh.	MP	Allis-Chalm.
1	25	575	Sh.	MP	Northern
1	30	600	Sh.	MP	Burke
1	30	250/800	Cp.	MP	General Elec.
1	35	610	Sh.	GL-B	General Elec.
1	40	975	Cp.	GL-B	General Elec.
1	40	675	Sh.	MP	Northwestern
1	40	850	Cp.	S	Westinghouse
1	40	550	Sh.	M	Westinghouse
1	50	850	Sh.	S	Westinghouse
1	50	625	Sh.	MP	Northern
1	50	625	Sh.	A-40	Milwaukee
1	50	950	Cp.	CCD	Crocker-Wheeler
1	80	630	Cp.	CQ	General Elec.
1	120	450	Cp.	MP	General Elec.
1	130	550	Cp.	S	Westinghouse
1	134	650	Cp.	MP	Morgan-Gardner
1	150	680	Cp.	MP	Jenny
1	400	200	Cp.	MP	General Elec.
1	165	650	Cp.	M	Westinghouse
1	300	340	Cp.	CCD	Crocker-Wheeler

DUQUESNE
New and used Electrical Equipment
Electric & Mfg. Co.

PITTSBURGH, PA.

ELECTRIC CAR

6 ton capacity

220 Volt D. C. 36" GAUGE. One side dump. Good condition.

S. R. VANDERBECK
20 So. 15th St. PHILADELPHIA, PA.

GENERATORS

1—100 KW. D.C., 110-125 volt, 250 R.P.M., bearings, rheostat, half coupling.
1—150 KW. D.C. 250 volts, 200 R.P.M.

BELTED ENGINES

1—16½" x 30" Buckeye Engine.
1—20" x 48" Lane-Bodley Corliss.
1—11" x 21" Buckeye Engine.
1—24" x 24" Ball.

GAS ENGINES

1—125 KW. D.C., 250 volts, generator connected to four cylinder gas engine.

WATER TUBE BOILERS

1—250 H.P. Heine.
1—400 H.P., B. & W.

COMPRESSORS

1—18" x 18" Duplex Belt Driven Laidlaw-Dunn-Gordon Air Compressor.
2—18" x 12" x 12" Duplex Laidlaw-Dunn-Gordon Two Stage Belt Driven.

DOUBLE LEATHER BELTING as follows

1—Piece 18" wide 45' long.
1—Piece 20" wide 45" long.
1—Endless belt 30" wide 103' long.

MOTORS

1—75 H.P., A.C., 220 or 440 volt, 60 cycle, 3 phase. New.
2—100 H.P., A.C., 2200 volts, 60 cycle, 3 phase, Slip Ring Crocker-Wheeler with Starters.

CASTLE & WILSON

1601 Arrott Bldg., Pittsburgh, Pa.

Nathan Klein & Co.

Motors Motors
Motors Motors

Largest stock in America

Try Us Lowest Prices

Send for monthly bargain sheet.

"2 and 3 phase, 60 cycle, 220, 440 and 2,200 volt motors."

HP.	MAKE	RPM	TYPE
50	Whse.	1140	CCL
50	W. El.	900	
50	Whse	850	CCL
75	G. E.	900	K
75	Line.	1800	
75	G. E.	514	L
75	G. E.	900	
150	Whse.	700	CCL
150	G. E.	600	K
300	G. E.	450	

2,000 other items.

208 Centre St., N. Y. City

NEW BOILERS

Prompt Shipment

Uniflow Return Tubular Boilers rated at 134, 155, 216, 259 and 313 H. P., 125 lbs. and 150 lbs. working pressure. Uniflow Boilers are noted for high efficiency, great overload capacity compactness and smokeless setting.

Wire or Write for Quotation
UNIFLOW BOILER CO., INC.
15th and Market Sts., Philadelphia, Pa.

Return Tubular and Portable Boilers

2—72" x 20' Flush fronts 150 lbs.
1—72" x 18' Flush front 125 lbs.
1—200 H. P. Berry—No brick setting required, 130 lbs.
3—150 H. P. Berry—No brick setting required, 130 lbs.
1—100 H. P. Economic. No brick setting required, 125 lbs.

Power Equipment Company, Engrs., Philadelphia, Pa.

BOILERS

	Pressure
5—250 H.P. Wickes boilers,	150-lb.
1—300 H.P. Wickes boiler,	150-lb.
4—250 H.P. B & W boilers,	150-lb.
1—250 H.P. B & W boiler,	125-lb.
2—210 H.P. B & W boilers,	125-lb.
1—400 H.P. Stirling boiler,	150-lb.
1—260 H.P. Stirling boiler,	150-lb.
2—150 H.P. Stirling boilers,	150-lb.
1—400 H.P. Erie City boiler,	150-lb.
1—225 H.P. Geary boiler,	150-lb.
1—200 H.P. Scotch marine boiler,	125-lb.
1—500 H.P. Keeler boiler,	160-lb.
2—200 H.P. Scotch marine boilers, with wet back, good for marine purposes,	125-lb.
3—72" x 18' tubular boilers,	125-lb.
1—72" x 16' tubular boiler,	125-lb.
8—66" x 16' tubular boilers,	125-lb.
2—54" x 14' tubular boilers,	100-lb.

1—14 x 36 Corliss engine.
1800 agricultural gasoline engines (new)

OTHER MAKES AND SIZES

Steel smoke stacks.

J. F. DAVIS
1409 Harris Trust Building Chicago, Ill.

Water Tube Boilers

3—500 H. P. Stirling, 175-lb. pressure. Extra heavy flanged steam header. Individual stacks.

4—250 H. P. Stirling, same as above.

2—400 H. P. Babcock & Wilcox, 160-lb. pressure.

Innumerable others—all sizes.

Power Equipment Company, Engrs.
1218 Chestnut Street Philadelphia, Pa.

Direct Current, Direct Connected Units 110-125 Volts
With high grade Engines

1—500 K. W. 2—300 K. W. 1—100 K. W.
1—62½ K. W. 1— 50 K. W. 1— 40 K. W.
1— 25 K. W.

Power Equipment Company, Engrs.
1218 Chestnut Street Philadelphia, Pa.

BOILERS
Immediate Shipment

	ea.
3—72"x18' Hor. Tub. 125 lb. St.	$1500
2—66"x16' Hor. Tub. 125 lb. St.	1000
2—60"x16' Hor. Tub. 125 lb. St.	750
2—400 H.P. Wickes W.T. 150 lb.	5500
2—300 H.P. Wickes W.T. 150 lb.	4000
1—200 H.P. Manning Vert. 125 lb.	3000

Send for complete stock list.

Wickes Machinery Co.

America's Largest Machinery House

Jersey City, N. J.

Equipment Wanted

For Machine Shops, Foundries, Iron and Steel Works, Mines, Railroads and Metal-Working Plants Generally

ADVERTISING RATES: 1" One Time $3.50; 2" One Time $6.50; 3" One Time $9.50; 4" One Time $12.00.
RATES FOR LARGER SPACE OR LONGER PERIODS FURNISHED ON REQUEST

WANTED

Good Second Hand Air Compressor belt driven about 10x12.

1 Grey Iron Cupola 48" diameter outside.

1 Sheet Iron Brake with capacity to handle plates $\frac{1}{16}$" thick by 96" wide.

Eagle Iron Works Co.,
Terre Haute, Ind.

Flour Mill Roll Corrugator

wanted. New or second hand. Give description, make, size, weight, present condition, and lowest cash price.

R. R. Howell & Co.
Minneapolis, Minn.

WANTED
Second Hand Hammers

1—5000-lb. to 7500-lb. Steam Drop Hammer.
2—1500-lb. to 2500-lb. Board Drop Hammers.
1—2500-lb. to 3000-lb. Steam Forging Hammer.

Must be in first class condition.

Twin City Forge and Foundry Company
Stillwater, Minnesota

WE BUY FOR CASH
ANY SURPLUS STOCK OF

Bar Iron
Bar Steel
Structural Material
Plates, Sheets, Etc.
Good Second Hand Iron and Steel

Send itemized lists with full description and prices

AMIRON SUPPLY CO., Inc.
137th St. and Lincoln Ave. New York

WANTED
One Bending Roll

electric driven, 16 ft. wide x 1½" plate capacity.

One plate planer, electric driven, 20 ft. to 24 ft. capacity, 1½" plate.

One electric hammer, 1 to 1½ ton capacity.

New or second-hand machines in good condition.

State name of maker, price, and when can be had for delivery.

Address Box 895
THE IRON TRADE REVIEW, Cleveland, O.

WANTED

For immediate delivery one 800 HP. Corliss simple condensing engine, speed 80 RPM to 100 RPM for 150 lbs. pressure at throttle, with 20 foot diameter flywheel grooved for fifteen 2" ropes; one 1200 HP Corliss simple condensing engine 80 RPM for 150 lbs. pressure at throttle; for rolling mill work. Please send photographs, blueprints, and complete specifications, stating where engines can be inspected.

Consolidated Rolling Mills & Foundries Co., Inc.
25 Broad Street, New York City

GALVANIZED SHEET SCRAP WANTED

18 gauge and heavier.

Address Post Office Box 22
Painesville, Ohio

WANTED

One Blue Print Machine, must be in good condition.

The Canton Sheet Steel Company
Canton, Ohio

WHEEL PRESSES

Want 3—150 to 300 Ton horizontal hydraulic Wheel Presses. Give full details and price.

Address Box 936
THE IRON TRADE REVIEW, Cleveland, O.

WANTED

Hot press nut making machines, sizes $\frac{5}{8}$"—1"—1½".

Automatic Burring Machines, sizes $\frac{3}{4}$"—1½" and 2".

Semi-Automatic nut tapping machines, 6-spindle, 1"—1½" and 2".

Address Box 944
THE IRON TRADE REVIEW, Cleveland, O.

LISTEN!

Opportunity knocks—but you've got to meet her at the door.

Watch these pages!

617

SECOND-HAND
FOUNDRY EQUIPMENT WANTED

Including cupolas, ladles, tumbling barrels, etc. Quote price and state condition.

Address Box 698
THE IRON TRADE REVIEW, Cleveland, O.

TANKS

Various sizes; describe fully, name price and location.

Address Box 824
THE IRON TRADE REVIEW, Cleveland, O.

"Ask here for what you need and get satisfied"

Fill-in and Contract Work

Where orders may be secured for machine work, foundry work, stamping, forging, jig, tool, die and pattern making, special machinery, experimental work, etc.; where special work may be secured for prompt delivery.
ADVERTISING RATES: 1" One Time $3.50; 2" One Time $6.50; 3" One Time $9.50; 4" One Time $12.00.
RATES FOR LARGER SPACE OR LONGER PERIODS FURNISHED ON REQUEST

WANTED
Work for Machine Shop
Gray Iron Foundry in Connection.
Floor space 65000 square feet
The Challenge Machinery Co.,
Grand Haven, Mich.

Gray Iron Castings and Machine Work
THE SIMPSON FOUNDRY CO.
Service Newark, Ohio Quality

WE SPECIALIZE ON
Small Malleable Castings
Send Samples for Prices
EARLY DELIVERY
Columbia Malleable Casting Co., Inc.
Columbia, Pa.

To Replace War Contracts
Having decided to reduce our line of Wood Working Machinery and specialize on certain machines, we offer for sale at fraction of actual cost, Patterns, Core Boxes, Good-will, etc., for a practical, under chain feed, Straight Line Ripper and Edger. This machine is now on the market and in successful operation for several years. Photos of machine on request.
Pentwater Machinery Company, Pentwater, Mich.

We are looking for outside work for our
Machine, Pattern and Smith Shops Brass, and Gray Iron Foundry
Send Blue Prints for estimates.
Klotz Machine Co.
Sandusky, Ohio

Diamond Machine Company
Manufacturing Engineers
Contract and Machine Work
Pattern Work
Estimate Furnished.
Monongahela, Pa. (Pittsburg District)

The West Steel Casting Company
Cleveland, Ohio
Have Foundry and Machine Shop Capacity Idle.
Specialty—Small steel castings and wheels of all forms up to four feet in diameter. We have been 100% Government work and must turn over to Commercial business immediately. Want turning and boring mill work for
10—42 inch Niles and Bullard Boring Mills.
16—34 inch Gisholts.
Wire or phone if you have work.

The C. C. Foundry Co. MIDDLETOWN OHIO U.S.A.
"DURO" Pure Iron
Manufacturers of "Duro" Rust Resisting Silos and Tanks. Equipped to produce 7 to 27 Gauge. Sketches-Circles-Flanged Heads, Angles, Channels. In and out angle rings, stamping, acetylene welding. Let us quote on your specifications, please.

Gray Iron Castings
We have surplus capacity and can furnish medium machine castings up to 25,000 pounds. Our castings are above the average; our supply of pig iron abundant. Send us your specifications.
Crawford & McCrimmon Co.
Brazil, Ind.

Deep Metal Drawing,
Metal Stamping,
Spot Welding.
The Burr Manufacturing Co.
Cleveland, Ohio

PRECISION WORK
Products of
Automatic and Hand Screw Machines
S. A. E. NUTS AND TAPER PINS
THE METAL MACHINING TOOL CO.
2176 East 76th Street Cleveland, Ohio

Wanted Contract Work
Metal Stampings.
Drawing and Thread Rolling.
Automatic and Hand
Screw Machine Products.
Small Gear Cutting.
Enameling—Polishing—Nickel and Copper Plating.
Send Print or Sample for estimate.
The Seiss Manufacturing Co.
126 Alexis Ave. Toledo, Ohio

J. E. WILLIAMSON CO.
Bellwood, Pa.
Grey Iron Machinery and Engine Castings up to 5000 lbs.
Quality and service guaranteed.

FORGINGS
Gear blanks, bars, rods, shafting.
How you want them.
When you want them.
JOLIET FORGE CO.
Joliet, Ill.

"When you need work here's the place to go after it"

First class manufacturing concern which has been engaged exclusively on high grade war work for the past three years, employing about eight hundred hands, located in Northeastern Pennsylvania,

WOULD LIKE TO NEGOTIATE FOR A BONA FIDE PROPOSITION, TO MANUFACTURE MECHANICAL DEVICES. EQUIPMENT SUITABLE FOR AUTOMOBILE OR TRACTOR PARTS OR SIMILAR WORK.

75,000 Sq. Ft. of Floor Space with plenty of ground for expansion.

The Company has a highly developed organization and is in position to finance any reasonable proposition.

Address Box 927
THE IRON TRADE REVIEW Cleveland, Ohio

Service? Here you are!

The advertisers who are represented in the "Fill-in and Contract Work" section offer you their services to the extent of their capacity.

One or more of these concerns may be in a position to give you reasonably prompt delivery on your castings; machining; patterns; stamping. Consult them for they want to serve you.

In the meantime if we can be of service to you in any way do not hesitate to command us.

THE IRON TRADE REVIEW
Cleveland

SPECIAL
SCREW MACHINE
PRODUCTS
Automatic and Hand Equipment
WELLMAN PRODUCTS CO.
1444 E. 49th St., Cleveland, O.

We have a Well Equipped
Daylight Machine Shop
For building special machinery.
Special gasoline and steam motors, etc.
Let us figure with you.
Lammert & Mann Company
Wood and Walnut Sts. Chicago, Ill.

Canadian Company
manufacturing
Metal Products
invites correspondence with American concerns wishing to have goods
manufactured or assembled in Canada.
Address Box 928
THE IRON TRADE REVIEW, Cleveland, O.

MetalStampings
DIES TOOLS JIGS
Let Us Estimate on Your Work
LANSING STAMPING & TOOL CO.
Dept. A LANSING, MICH.

WANTED
Sheet Metal Work
Stampings, Polishing, Plating
Prepared for Government sublet work. Send blue prints or samples for estimates. Quick service.
The Bellevue Manufacturing Co.
Bellevue, Ohio

Pattern Work
Wood, Brass, or Aluminum Patterns.
Accurate work. Prompt Delivery.
Marion Malleable Iron Works
Dept. P. S. Marion, Indiana

The Colonial Iron Works Company
WE WANT TO FIGURE ON YOUR WORK

SEND US YOUR PLANS AND SPECIFICATIONS
STEEL SHEET, PLATE AND STRUCTURAL WORK
881-885 E. 67th Street CLEVELAND, OHIO.

PATTERN WORK
WOOD AND METAL
Send Prints for Estimate
E. M. SMITH & CO.
PEORIA, ILL.

High-Grade

Metal Stampings
Tubular Products
Welded Products
Steel Shapes
Metal Specialties
Special Drawing and Forming

We are prepared to render prompt service on any of the above products and have an immense equipment for large production orders.

Send us blue prints and specifications of your requirements, no matter how simple or complicated they may be and we will quote promptly.

"Our Specialty is Prompt Service"

Perfection Metal Products Co.
College Point, N. Y.

Telephone, Flushing 2274

Index to Advertisements

See "WHERE-TO-BUY" for classified-by-products list of advertisers

The (*) indicates that the advertisement appears alternate weeks; the dagger (†) once a month.

A

Abell-Howe Co. 148
Aborn Steel Co., Inc. 3
Abramsen Engineering Co. 74
†Acme Machine Tool Co. ..... —
Acme Steel Goods Co. 101
Acme Steel & Mal. Iron Works, Inc. 115
Adamson Machine Co. 111
Addy, Matthew, Co. 26
Aetna Steel Castings Co. 117
Air-tight Steel Tank Co. 97
*Akron Gear & Engineering Co. .... —
Akron-Selle Co. 38
Allegheny Foundry & Machine Co.. 122
Allegheny Steel Co. 35
*Allen, John F., Co. 74
*Alliance Machine Co. 129
Alliance Structural Co. 141
Allis-Chalmers Mfg. Co. 56
Allyne-Ryan Foundry Co. 113
Amalgamated Machinery Corp. 80
†Amalgamated Products Co., Inc... —
American Boron Products Co., Inc.. 146
American Bridge Co. 85
American Chain Co., Inc. 168
*American Clay Machinery Co. 105
*American Fire Clay & Products Co. 151
American Foundry Equipment Co... 101
*American Hardware Corp. ..... —
American Incandescent Heat Co., Inc. 140
American Machinery Exchange, Inc.. 158
American Malleable Castings Co... 120
*American Malleables Co. 118
American Pipe Bending Machine Co. 101
American Refractories Co. 150
American Sheet & Tin Plate Co... 41
American Shop Equipment Co. 141
American Steel Co. 45
*American Steel Export Co. ..... —
American Steel Foundries. 113
American Steel & Wire Co. 134
American Tube & Stamping Co. 40
*American Vanadium Co. ..... —
Amiron Supply Co., Inc. 170
†Anderson Die Machine Co. ..... —
†Anderson Pattern Works. ..... —
Andrews Steel Co. 29
Angle Steel Stool Co. ..... —
†Arcade Manufacturing Co. ..... —
†Armstrong Cork & Insulation Co.. —
Ashland Fire Brick Co. 150
Atlantic Equipment Co. 165
*Atlantic Foundry Co. ..... —
Atlantic Mfg. Co. 138
Atlantic Steel Castings Co. 113
Atlas Car & Mfg. Co. 70
Atlas Crucible Steel Co. 138
Atlas Steel Casting Co. 111
Auburn Ball Bearing Co. 99

B

*Baker Brothers ..... —
†Barnes, Wallace Co. ..... —
Barnett, G. & H., Co. 101
Bartlett, C. O., & Snow Co. 63
Basic Products Co....50, 73, 149, 151
Bay City Forge Co. 125
†Bayonne Bolt & Nut Co. ..... —
Bayonne Steel Casting Co. 115
†Beals, McCarthy & Rogers. ..... —
Beaudry & Co., Inc. ..... —
*Becker Milling Machine Co. ..... —
Belle City Malleable Iron Co. 119
Bellefontaine Bridge & Steel Co... 140
Bellevue Mfg. Co. 173
Belmont Iron Works. 28
Bennett, G. L., Machinery Co., Inc. 164
*Bessemer Brick Co. ..... —
Bethlehem Steel Co. 20
*Bettcher Stamping & Mfg. Co. .... —
Betts Machine Co. 134
Bidle, W. S., Co. 73
Biggs-Watterson Co. 164
Birdsboro Steel Fdy. & Machine Co. 71
Blackwell, Geo. G., Sons & Co., Ltd. 143
Blair Engineering Co. 140
†Blake & Johnson Co. ..... —
Blaw-Knox Co. 15
Bliss, E. W., Co. 71
Boker, H., & Co., Inc. 21
†Bonnot Co. 48
Bossert Corp. 139
†Bothfield Specialties Mfg. Co.... 150
Bowler Foundry Co. 117
Braddock Mfg. Co. 33
Bradley, C. C., & Sons, Inc. 76
Breitung, E. N., & Co. 142
Bridgeford Machine Tool Works... 150
Brier Hill Steel Co. 37
Brighton Fire Brick Co. 149
†Broozbraswyt Metals Co. ..... —
Brosius, Edgar E. 133
†Brown Hoisting Machinery Co.... —
Brown Instrument Co. ..... —
†Brown-Wales Co. ..... —
Buckeye Blower Co. 73
Bullard Machine Tool Co. ..... —
Burnside Steel Co. 111
Burr Mfg. Co. 171
Byers, A. M., Co. ..... —
Byers, John F., Machine Co. 131

C

*Caldwell, W. E., Co., Inc. 97
Calleson, C. A. 162
Cambria Steel Co. 19
Camden Forge Co. 18
*Canada Carbide Sales Co. ..... —
*Canton Pattern & Mfg. Co. 101
†Canton Sheet Steel Co. 170
Carlin, Anthony, Co. 138
Carlyle Johnson Machine Co. 71
Carnahan Tin Plate & Sheet Co.. 42
Carnegie Steel Co. 14
Carpenter, Geo. B., & Co. ..... —
†Cascade Foundry Co. ..... —
Case Crane & Engineering Co. 128
Castle & Wilson. 169
Celite Products Co. 149
*Central Iron & Steel Co. ..... —
Central Steel Co.....1487 (Editorial)
Central Tube Co. 136
Centre Foundry & Machine Co.... 122
Century Steel Works. 3
Challenge Machinery Co. 171
Chambersburg Engineering Co. 95
Champion Machine & Forging Co... 124
Chapman Engineering Co. 49
Chase, Frank D., Inc. ..... —
Chase Foundry & Mfg. Co. 137
Chesapeake Iron Works. 130
Chicago Rawhide Mfg. Co. 95
†Cincinnati Electrical Tool Co.... —
Cincinnati Iron & Steel Co. ..... —
†Cincinnati Milling Machine Co.... —
†Cincinnati Planer Co. ..... —
City Forge & Fdry. Co. 170
City Foundry Co. 121
Clarendon Refining Co. 46
†Clark, Chas. J. ..... —
†Clark Brothers Bolt Co. ..... —
Clearfield Fire Brick Co. 149
Cleveland Cliffs Iron Co. 176
Cleveland Crane & Engineering Co.. 126
Cleveland Hardware Co. 125
Cleveland Knife & Forge Co. 99
Cleveland Pneumatic Tool Co. 101
Cleveland Power Transmission Co... —
Cleveland Punch & Shear Works Co. 77
Clinton Metallic Paint Co. 148
Colonial Iron Works Co. 173
Colonial Steel Co. 26
*Colonial Supply Co. 136
Columbia Mall. Casting Co., Inc.. 171
*Columbia Steel Co. (San Francisco) —
Columbia Steel & Shafting Co.... 84
†Columbian Hardware Co. ..... —
†Columbus Forge & Iron Co. ..... —
Columbus Malleable Iron Co. 121
Combustion Engineering Corp...3, 56
Connecticut Electric Steel Co., Inc. 115
*Connersville Blower Co. 2
Consolidated Rolling Mills & Fdries. Co., Inc. 170
Cooper, C. & G., Co. 95
*Corbin Screw Corp. ..... —
Crawford & McCrimmon Co...121, 171
Crocker, Samuel A. ..... —
Crocker Brothers 142
Crosman Stamping Co. 38
Crowley, John A., Co. ..... —
Crucible Steel Casting Co. 115
†Cruse-Crawford Mfg. Co. ..... —
Cumberland Steel Co. 139
†Cutler-Hammer Mfg. Co. ..... —
*Cuyahoga Machine & Tool Co.... 99
Cyclops Foundry Co. 117

D

Dake Engine Co. 130
Danville Malleable Iron Co. 118
Dart, E. M., Mfg. Co. 136
Davis, J. F. 169
Davis-Bournonville Co. ..... —
Davison, Allen S., Co..50, 73, 149, 151
Dayton Malleable Iron Co. 121
Dayton Steel Foundry Co. 113
Dean Brothers Steam Pump Works. 97
Decatur Malleable Iron Co. 120
*Delaware River Steel Co. ..... —
Deming Co. 97
Dempsey, H. B., Furnace Co. 141
De Queen & Eastern R. R. Co.... 163
Des Moines Bridge & Iron Co.... 138
Detroit Seamless Steel Tubes Co.. 136
Diamond Machine Co. 171
†Disston, Henry & Sons, Inc. ..... —
Dixon, A. Morris. 154
Dixon, Joseph, Crucible Co. 56
Doelger & Kirsten Co. 76
Donner Steel Co., Inc. 33
Dover Fire Brick Co. 149
Drop Forging Co. of N. Y. 125
†Duer Spring & Mfg. Co. ..... —
†Duff, Samuel E. ..... —
Duquesne Electric & Mfg. Co.... 169

E

Eagle Iron Works. 170
Eaton, Rhodes & Co.....142, 145
Eccles, Richard, Co. 125
†Economy Drawing Table Co. ..... —
Edwards Mfg. Co. 139
*Electric Controller & Mfg. Co.... 178
Electrolytic Oxy-Hydrogen Lab., Inc. 49
Ellis, Frank I. 140
Empire Art Metal Co., Inc. 12
Erdle Perforating Co. 74
Erie City Iron Works. 97
Erie Foundry Co. 124
Erie Malleable Iron Co. 120
†Espen-Lucas Machine Works. ..... —
Euclid Crane & Hoist Co. 130
Excelsior Tool & Machine Co. 122

F

Fahnestock Manufacturing Co. 150
*Fairbanks-Morse & Co. ..... —
Fairmount Mining Machinery Co.... 159
*Falk Company ..... —
Fanner Mfg. Co. 101
*Farrar & Trefts, Inc. 121
†Farrell Foundry & Machine Co... —
*Farrell-Cheek Steel Foundry Co.. —
Fawcus Machine Co. 99
Federal Export Corp. ..... —
†Federal Steel Foundry Co. ..... —
Ferguson Steel & Iron Co. ..... —
Ferro Supply Corp. ..... —
Ferry Cap & Set Screw Co. 138
Firth-Sterling Steel Co. 3
First National Bank of Boston.... 13
Flexible Steel Lacing Co. ..... —
Flour City Ornamental Iron Co.... 164
Ford, J. B., Co. 146
Fort Pitt Spring & Mfg. Co. 134
Fouts, C. C. Co. 171
*F. P. Screw Co. ..... —
Franklin Steel Works. 27
†Frazer & Jones Co. ..... —
Freeman Fire Brick Co. 151
Freyn, Brassert & Co. 140
Fuller-Lehigh Co. 50

G

Garden City Foundry Co. 118
Garrison, A., Foundry Co. 66
*Garwood Bronze & Iron Works.... —
*General Briquetting Co. 140
General Drop Forge Co. 124
General Electric Co. 95
General Steel Co. 31
Gier Pressed Steel Co. 139
Gilbert & Barker Mfg. Co. 57
Gisholt Machine Co.....78, 79
Globe Iron Co. 143
†Globe Steel Co. ..... —
Goodrich, B. F., Co. 155
†Gordon Sand Co., Inc. ..... —
Grand Rapids Brass Co. 154
Graton & Knight Mfg. Co. 99
Graves Machinery Exchange. 158
†Greaves-Klusman Tool Co. ..... —
Greb Co., Inc. 99
Green, A. P., Fire Brick Co. 51
Green, L. A. 165
Green Engineering Co. 133
Griffin Mfg. Co. 139
*Gwynn Engineering Co. 141

H

Hagan, George J., Co.....3, 56
Haiss, George, Mfg. Co. 132
Hammond Malleable Iron Co. 120
†Hammond Steel Co., Inc. ..... —
Hanna, M. A., & Co. 147
Harbison-Walker Refractories Co.. 149
Harris Bros. Co. 159
*Harrisburg Pipe & Pipe Bending Co. —
†Hart, R. A., Mfg. Co. ..... —
†Harvey, Arthur C., Co. ..... —
*Hauser-Stander Tank Co. ..... —
Haynes Stellite Co. ..... —
Hayward Co. 133
†Hein Furniture Co. ..... —
Hendrick Mfg. Co. 139
Heppenstall Forge & Knife Co.. 124
*Hickory Steel-Grip Glove Co. 93
Hillman, J. H., & Sons Co. 47
Hinman, D. A., & Co. ..... —
*Holcomb Safety Garment Co. 107
†Homestead Valve Mfg. Co. ..... —
Hoover Steel Ball Co. ..... —
Horsburgh & Scott Co. 95
Howell, R. R., & Co. 170
*Hubbard Steel Foundry Co. ..... —
Hunter Saw & Machine Co. 82
Huther Brothers Saw Mfg. Co. .... —
Hyatt Roller Bearing Co.....8, 9
†Hyde Park Foundry & Machine Co. —
Hydraulic Press Brick Co. 149

I

Illinois Malleable Iron Co. 121
Illinois Steel Co. 4
Illinois Steel Co., Warehouse Dept. 32
Illinois Steel Warehouse Co. 32
Industrial Electric Furnace Co. ..... —
Industrial Works 133
Ingalls-Shepard Forging Co. 124
Ingersoll Milling Machine Co. 154
Inland Steel Co. 16
Interlake Pulp & Paper Co. 168
International Oxygen Co. 101
Interstate Iron & Steel Co. 138
Irton Portland Cement Co. 162

J

†Jaeger, M. ..... —
*Jennison-Wright Co. 55
Jersey Forging Works. 124
Johnson Carlyle Machine Co. 71
Johnson, Thomas V. 107

†Johnson Pattern Co..... —
Joliet Forge Co..... 171
†Jones & Lamson Machine Co.... —
Jones & Laughlin Steel Co..... 30

K

Kalamazoo Malleable Iron Co.... 113
Kelly & Jones Co..... 111
†Kempsmith Mfg. Co..... —
Kennedy, Julian 140
Keokuk Electro-Metals Co..... 143
Keystone Bronze Co..... 122
Kidd Drawn Steel Co..... 137
Kier Fire Brick Co..... 150
Kilby Mfg. Co..... 101
Klein, Nathan, & Co..... 169
Klotz Machine Co..... 171
•Knapp Fence Co..... 134
•Knott & Harker Co..... —
Koppel Industrial Car & Equip. Co. —
•Koppers, H., Co..... —
Kratzer, W. N., & Co..... 137
Kriser, Charles 155

L

La Belle Iron Works..... 41
Lackawanna Steel Co..... 36
Laclede Steel Co..... 139
Lakeside Bridge & Steel Co..... 132
Lakeside Forge Co..... 99
Lakeside Malleable Castings Co... 120
Lakewood Engineering Co..59, 60, 61, 62
†Lambert Machine & Eng. Co.... —
Lammert & Mann Co..... 173
Lancaster Foundry Co..... 122
†Landis Machine Co..... —
Landis Tool Co..... —
•Lansing Foundry Co..... —
Lansing Stamping & Tool Co.... 173
Latrobe Electric Steel Co..... 25
Laughlin, Alex., & Co..... 140
Lavino, E. J., & Co..... 151
Leard, Wm., Co..... 137
Lewis Foundry & Machine Co..... 95
•Liberty Steel Co..... 139
†Liberty Steel Products Co., Inc.. —
†Lincoln Engineering Co..... —
•Linde Air Products Co..... —
Lindsay, W. W., & Co., Inc..... 72
Link-Belt Co. 135
Lockhart Iron & Steel Co..... 35
•Louisville Fire Brick Works..... —
†Lubricating Metal Co..... —
Ludlum Electric Furnace Corp.... 141
Ludlum Steel Co..... 24
Lunkenheimer Co. 136

Mc

•MacGovern & Co., Inc..... 167
†McCalla, Harold, Co..... —
McClintic-Marshall Co. 30
McClure, G. W., Son & Co..... 141
McConway & Torley Co..... 28
McCoy-Brandt Machinery Co..... 168
McKee, Arthur G., & Co..... 141
McKeefrey & Co..... 142
McKinnon Iron Works Co..... 122
McLain Fire Brick Co..... 151
McMyler Interstate Co..... 130

M

Mackintosh, Hemphill & Co..... 64
Macomber & Whyte Rope Co.... 134
•Madison Foundry Co..... —
Magnesia Association of America.. —
Mahr Mfg. Co..... 138
Mal-Gra Castings Co. 118
Manning, Maxwell & Moore, Inc.. 130
†Manown Mfg. Co..... —
Mansfield Sheet & Tin Plate Co.. 39
Marion Malleable Iron Works..118, 173
•Mark Mfg. Co..... —
Marshall, Edward E..... 143
Marshall Foundry Co..... 122
Massillon Foundry & Machine Co.. 95
Maynard Elec. Steel Castings Co.. 115
†Merrill Brothers ..... —
Merritt, Franklin W..... 146
Mesta Machine Co..... 65
Metal Machining Tool Co..... 171
Metals Service Co..... 137
†Michigan Bolt & Nut Works.... —
Michigan Steel Castings Co..... —
Midgley & Prentice, Inc..... 154
Midvale Steel & Ordnance Co..... 19
Miller, W. R., Co..... 140
Milton Manufacturing Co.....44, 163
Milwaukee Elec. Crane & Mfg. Co.. 128
Milwaukee Steel Foundry Co..... 113
Miner-Morse Corp. ..... —
Minerva Tungsten Corp..... 146
Missouri Malleable Iron Co..... 118
Mitchell-Diggins Iron Co..... 142
Mitchell-Tappen Co..... 163
Modern Machinery Exchange..... 157
†Modern Tool Co..... —
•Mohr, J. J., & Son..... —
†Moline Malleable Iron Co..... —
Moltrup Steel Products Co..... 22
Monongahela Iron & Steel Co..... 143
†Moore, Geo. W..... —
Moore, W. E., & Co..... 140
Morgan Construction Co.....52, 53
Morgan Engineering Co..... 127
Morton Mfg. Co..... 80
Mount Vernon Bridge Co..... 140
Mudge, Edmund W., & Co..... 30
Quigley Furnace Specialties Co..141, 149

N

Nagle Steel Co..... 32
National Bolt & Nut Co..... 138
National Engineering Co..... 68
National Foundry Co..... 111
National Machinery Co..... 101
National Pressed Steel Co..... 36
National Products Co.....40, 163
National Roll & Foundry Co..... 68
National Steel Foundries..... 113
•National Tool Co..... —
National Tube Co.....6, 7
Neely, B. C..... 149
Newark Stamping & Foundry Co... —
†Newbold, R. S., & Son Co..... —
New Britain Machine Co..... 40
New Departure Mfg. Co..... 99
New Jersey Machinery Exchange.... 159
Newport Rolling Mill Co..... 29
†New Process Gear Corp..... —
Newton Machine Tool Works, Inc.. —
N. Y. Revolving Port. Elevator Co. 150
Niagara Electric Furnace Co., Inc. 142
Nicholson File Co..... 101
Niles-Bement-Pond Co. 76, 128
•North Buffalo Hardware Foundry.. 121
Northern Ohio Traction & Light Co. 165
Northern Engineering Co..... 128
†Northwestern Malleable Iron Co.. —
Norwalk Iron Works Co..... 97

O

Oglebay, Norton & Co..... 142
•Ohio Electric & Controller Co... —
•Ohio Foundry Co..... —
•Ohio Steel Foundry Co.1489 (Editorial)
Oldham, George, & Son Co..... 101
Oliver Iron & Steel Co..... 44
Onondaga Steel Co., Inc..... 34
Orenstein-Arthur Koppel Co..... —
Orth, Frank 151
Orton & Steinbrenner Co..... 128
Otis Steel Co..... 66
•Oxweld Acetylene Co..... 177

P

Pacific Coast Steel Co...138, 163, 168
Page Steel & Wire Co..... 137
Pangborn Corporation 103
Pannier Brothers Stamp Co..... 134
Paragon Refining Co..... 48
Patch, F. R..... 122
Pawling & Harnischfeger Co..... 132
Payne, N. B., & Co..... 130
†Peerless Drawn Steel Co..... —
Peerless Machine Co..... 82
•Pelton Steel Co..... —
Penn Mold & Mfg. Co..... 34
Penn Seaboard Steel Corp..... 117
Pennsylvania Engineering Works.... 141
Pentwater Machinery Co..... 171
Peoria Malleable Castings Co..... 120
Perfection Metal Products Co..... 173
Pettler, P., & Son..... 155
Philadelphia Roll & Mach. Co.... 109
†Phillips & McLaren Co..... —
Phoenix Iron Co..... 137
Phoenix Iron Works Co..... 97
•Pickands, Brown & Co..... 145
Pickands, Mather & Co..... 144
Pittsburgh Annealing Box Co..... 146
†Pittsburgh Cold Rolled Steel Co.. —
†Pittsburgh Crane & Equipment Co. —
Pittsburgh-Des Moines Steel Co... 138
Pittsburgh Furnace Co..... 50
•Pittsburgh Iron & Stl. Fdries. Co. —
Pittsburgh Knife & Forge Co..... 99
Pittsburgh Malleable Iron Co..... 120
Pittsburgh Piping & Equipment Co. 136
Pittsburgh Rolls Corp..... 95
•Pittsburgh Saw & Mfg. Co..... 83
Pittsburgh Steel Co..... 35
•Pittsburgh Tool Steel Wire Co... —
Pittsburgh Valve Fdry. & Con. Co. 136
•Pittsburgh Wood Preserving Co.... —
Portage Silica Co..... 101
†Portsmouth Refractories Co..... —
Potts, Henry, & Co..... 164
Poughkeepsie, N. Y., Chamber of Commerce 154
†Powell, William, Co..... —
Power Equipment Co., Engrs..... .....159, 162, 165, 169
Power Piping Co..... 136
Pridmore, Henry E..... —
Producers Supply Co..... 122
Progressive Mfg. Co..... 43
Pyro Clay Products Co..... 151

Q

†Queen's Run Fire Brick Co..... —
Quickwork Co. 77
Quigley Furnace Specialties Co..141, 149

R

Racine Steel Castings Co..... 119
Racine Tool & Machine Co..... 83
Railway & Mine Supply Co..... 154
Railway & Power Equipment Co.. 165
•Ransom Mfg. Co..... —
Raymond Bros. Impact Pulverizer Co. 50
Raymond Mfg. Co..... 134
Reading Steel Casting Co.. 113
Reed Foundry Co..... 115
Reilly-Peabody Fuel Co..... 146
Reliance Steel Casting Co..... 113
Remington Arms Union Metallic Cartridge Co., Inc..... 155
Republic Creosoting Co...1493 (Editorial)
Republic Iron & Steel Co..... 22
Republic Structural Iron Works Co. 154
Revolvator Co. 150
†Richards, I. P., Co..... —
Richmond Malleable Castings Co.. 120
Rickert-Shafer Co. 99
Ridgway, Craig & Son..... 84
Riter-Conley Co. 30
Riverside Machinery Depot..160, 164, 165
†Rockford Bolt & Nut Co..... —
Rockford Drop Forge Co..... 124
•Rockwell, W. S., Co..... 146
Roebling's, John A., Sons Co.... 134
†Roessing-Ernst Co. ..... —
Rogers, Brown & Co. (Front Cover) 142
Rome Metal Products Co., Inc.... 136
•Roots, P. H., & F. M., Co.... —
•Ross-Meehan Foundries ..... —
•Royal Metal Mfg. Co..... —
Russell, Burdsall & Ward Bolt & Nut Co. 43
Russell Machine Co..... 160
Ryder Brass Foundry Co..... 117
•Ryerson, Joseph T., & Son..... 86

S

St. Louis Malleable Casting Co.... 120
St. Louis Steel Foundry Co..... 111
Samuel, Frank 142
Sand Mixing Machine Co..... 101
Schoonmaker, A. G., & Sons, Inc. 162, 165
†Scranton Forging Co..... —
Scully Steel & Iron Co..... 52
Seaman-Sleeth Co. 95
•Searle Mfg. Co..... —
Seiss Mfg. Co..... 171
•Semet-Solvay Co. 145
Seneca Iron & Steel Co..... 40
Shanafelt Mfg. Co..... —
†Sharon Fire Brick Co..... —
Sharon Foundry Co..... 111
Sharon Steel Hoop Co..... 17
Shaw Electric Crane Co..... 130
•Shawinigan Electro Products Co.. —
Shenango Furnace Co..... 144
Shepard Elec. Crane & Hoist Co.. 131
Shippers' Car Line.....155, 168
•Shover, Barton R..... —
Shuster, F. B., Co..... 75
Simmons Machine Co..... 161
†Simonds Mfg. Co..... —
Simpson Foundry Co..... 171
•Sivyer Steel Casting Co..1491 (Editorial)
Sleeper & Hartley, Inc..... 74
Sloan & Zook..... 47
Smith, E. M., & Co..... 173
Smith, Fasset & Co..... 107
Smith Gas Engineering Co..... 48
Smith, Geo. H., Steel Castings Co. 111
Smith, T. L., Co..... —
Smythe, S. R., Co..... 140
Snead Architectural Iron Works... 137
Snyder, W. P., & Co..... 144
Soisson, Jos., Fire Brick Co..... 150
•Southern Ferro-Alloys Co..... —
Southwark Foundry & Machine Co. 77
Standard Cruc. Steel Castings Co.. 111
•Standard Engineering Co..... 72
•Standard Foundry Co..... —
•Standard Gauge Steel Co..... —
Standard Malleable Iron Co..... 121
Standard Optical Co..... —
†Standard Sand & Machine Co.... —
Standard Scale & Supply Co..... 137
Standard Screw Products Co..... 138
•Standard Steel Castings Co..... —
Standard Tin Plate Co..... 139
Standard Tool & Mfg. Co..... 39
Stanley Works 38
Steel Car Forge Co..... 125
Steel Improvement & Forge Co.... 141
•Steel Industries Corp..... 32
•Stevenson Co. ..... —
Stewart Iron Co., Ltd..... 144
Stowe-Fuller Co. 151
Strong Steel Foundry Co..... 111
Struthers Furnace Co..... 142
Superior Charcoal Iron Co..... 146
Swindell, Wm., & Brothers..... 140

T

•Taylor, N. & G., Co..... —
•Taylor Instrument Companies.... 68
Taylor-Wharton Iron & Steel Co.. 117
Taylor-Wilson Mfg. Co..... 70
Tennessee Coal, Iron & R. R. Co.. 27
•Texas Co. ..... —
Thomas Furnace Co..... 142
Thomas Iron Co..... 144
†Thomas Spacing Machine..... —
Tioga Steel & Iron Co..... 123
Titanium Alloy Mfg. Co..... 23
Tod-Stambaugh Co. 142
†Toledo Bridge & Crane Co..... —
Toledo Machine & Tool Co..... 70
†Toledo Steel Tube Co..... —
Toomey, Frank, Inc..... 156
Treadwell Engineering Co..... 58
Trumbull Steel Co..... 42
Turner-Vaughn & Taylor Co..... 72
Twin City Forge & Fdy. Co..... 170

U

Uniflow Boiler Co., Inc..... 169
Union Drawn Steel Co..... 30
Union Electric Steel Co..... 138
Union Mining Co..... 150
•United Alloy Steel Corp..... —
United Engineering & Foundry Co.. 69
United Hammer Co..... —
United Smelting & Al. Co., Inc... 146
United States Alloys Corp..... 143
†United States Cast Iron Pipe & Foundry Co. ..... —
•U. S. Crane Co..... —

V

Valley Mould & Iron Corp..... 34
Vanadium Alloys Steel Co..... 26
Vanderbeck, S. R..... 169
Vermillion Malleable Iron Co..... 118
Vilter Mfg. Co..... 159
Vulcan Iron & Steel Co..... 143
•Vulcan Iron Works..... —
•Vulcan Steel Products Co..... 28

W

Walworth Mfg. Co.....10, 11
Ward's, Edgar T., Sons Co..... 42
Warren Oil Co..... 46
†Warner & Swasey Co..... —
Waterbury Co. ..... —
Wayne Machinery Co..... 165
†Webster & Perks Tool Co..... —
Weirton Steel Co..... 43
Wellman Products Co..... 173
Wellman-Seaver-Morgan Co..... ..... 1495 (Editorial)
†Western Tool & Mfg. Co..... —
Westinghouse Elec. & Mfg. Co..54, 162
West Leechburg Steel Co..... 38
West Steel Casting Co.....113, 171
•West Virginia Fire Clay Mfg. Co. 149
Wharton Steel Co..... 144
Wheeling Mold & Foundry Co..... 67
•Wheeling Steel & Iron Co..... —
Whitaker-Glessner Co. 31
•White, L. & I. J., Co..... —
Whiting Foundry Equipment Co.... 126
†Whiton, D. E., Machine Co..... —
Wickes Brothers 82, 134
Wickes Machinery Co.....166, 169
Wickwire Steel Co..... 134
†Wiggins, John B., Co..... —
Wilcox, D., Mfg. Co..... 125
Williams & Co., Inc..... 137
Williams, G. H., Co..... 133
Williams, J. H., & Co..... 70
Williamson, J. E., Co..... 173
†Williamsport Wire Rope Co..... —
•Wisconsin Electric Co..... 81
†Wisconsin Malleable Iron Co..... —
•Wolstoncroft, I. C..... 140
Wood, Alan, Iron & Steel Co.... 28
Wood, R. D., & Co..... 99
•Wright Wire Co..... —
Wrought Washer Mfg. Co..... 44

Y

†Yale & Towne Mfg. Co..... —
†Yoder Co. ..... —
Youngstown Foundry & Machine Co. 99
Youngstown Sheet & Tube Co.... 5

Z

Zanesville Malleable Co..... 120
Zelnicker, Walter A., Supply Co... 165

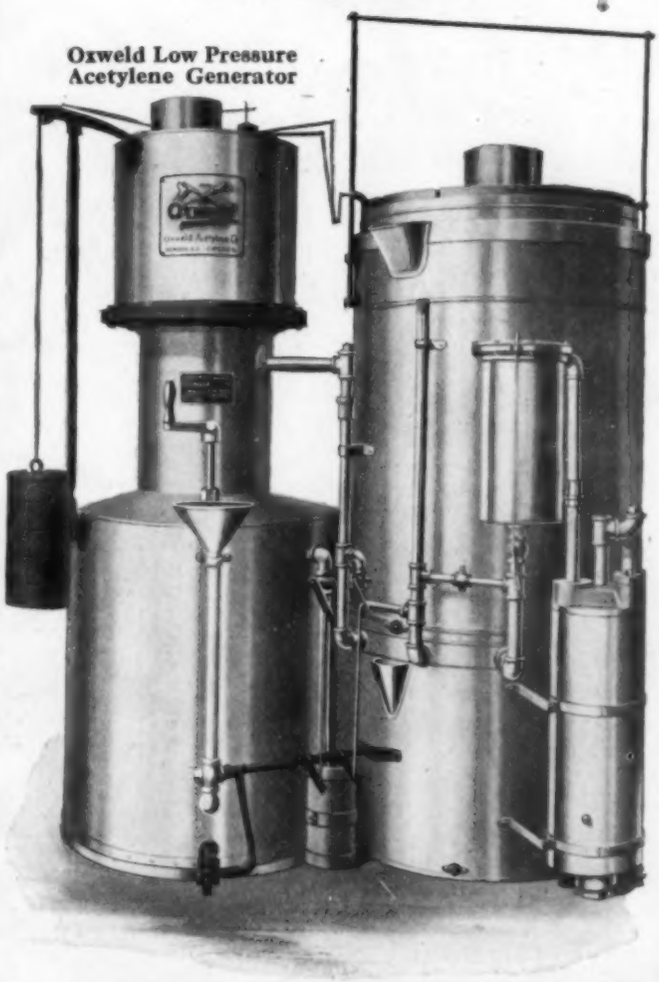
From Mine to Furnace
THE CLEVELAND-CLIFFS IRON CO.
Dealers in All Varieties of
LAKE SUPERIOR IRON ORES
20 PRODUCING MINES
Reliability in Shipments is assured through control of Ore Carrying Railroads ownership of Ore Docks and of a large Fleet of Steamships
THE CLEVELAND-CLIFFS IRON COMPANY
C C C
Cleveland Ohio
ESTABLISHED 1850

Oxweld

IN every department of every industry, wherever there is metal to join or cut, Oxweld Welding and Cutting Apparatus improves results and reduces costs.

1. In the actual putting together of the product itself, if it is a metal product, Oxweld works a revolution in efficiency and economy.

2. In the upkeep of the machinery and tools of the plant, whether in glass factory or textile mill, Oxweld makes sweeping eliminations in repair and replacement expense.



Oxweld Low Pressure Acetylene Generator

Oxweld Injector Type Welding and Cutting Blowpipes

are the most efficient and economical, regardless of the source of your acetylene gas supply. Where for portability or other reasons compressed acetylene is used from cylinders, Oxweld Injector Type Blowpipes utilize far more of the contents of the cylinders than will any other type of blowpipe.

Oxweld Low Pressure Acetylene Generators

possess advantages that are possible only in a generator of the low pressure type—namely, simple and automatic action, operation at a pressure of less than 1 lb. per square inch, and delivery of a constant flow of acetylene to the blowpipes at unvarying pressure.

Ask us for Bulletins

OXWELD ACETYLENE COMPANY

NEWARK, N. J. CHICAGO
LOS ANGELES

World's Largest Maker of Equipment for Oxwelding and Cutting Metals 143

NO PICTURES

WITH THIS ADVERTISEMENT TO ATTRACT YOUR ATTENTION. BUT TRY AND IMAGINE WITH US THIS PICTURE.

"COMING TO WORK IN THE MORNING, KNOWING THAT ALL YOUR MOTORS HAVE BEEN PROPERLY STARTED AND ALL DEPARTMENTS RUNNING.

REMEMBERING THAT YOU HAVE NO MORE TROUBLE WITH THOSE MOTORS WHEN LABORERS USED TO PUT THEM OUT OF COMMISSION OR BLEW FUSES IN STARTING THEM UP

KNOWING THAT IN CASE OF ACCIDENT ANYONE CAN PUSH THE NEAREST PUSH BUTTON AND STOP THE MACHINE.

WITH A FEELING OF SATISFACTION IN THE KNOWLEDGE THAT ALL YOUR STARTING DEVICES ARE DUSTPROOF, WEATHERPROOF, FIREPROOF, GASPROOF, AND BEST OF ALL—FOOLPROOF.

WITH ALL THIS FEELING OF SECURITY YOU CAN SETTLE DOWN AND THINK ABOUT PRODUCTION AND NOT ABOUT DELAYS OR UPKEEP EXPENSE OR WHERE TO GET ANOTHER GOOD ELECTRICIAN."

ISN'T THIS A WONDERFUL PICTURE?

YET IT IS NOT IMPOSSIBLE.

E. C. & M. AUTOMATIC COMPENSATORS WILL GIVE ALL THE RESULTS DESCRIBED AND MANY MORE.

WITH THIS PICTURE BEFORE YOU, SIT DOWN AND PHONE OR DROP A LINE TO OUR NEAREST OFFICE AND LET US HELP YOU TO BRING ALL THESE THINGS TO PASS.

E&M

THE ELECTRIC CONTROLLER & MFG. CO.

NEW YORK-50 CHURCH ST.
PITTSBURG-OLIVER BLDG.
BIRMINGHAM-BROWN-MARX BLDG.
SAN FRANCISCO-CALL BLDG.
CLEVELAND, OHIO.
LOS ANGELES-O.E.THOMAS, WASHINGTON BLDG.
CHICAGO-53 W. JACKSON BLVD.
DETROIT-DIME BANK BLDG.
TORONTO-TRADERS BANK BLDG.
SEATTLE-530 1ST. AVE. SOUTH
DENVER AND SALT LAKE CITY-O. H. DAVIDSON EQUIPMENT COMPANY

E&M